

# KNEWTON | **alta**

## **Statistics, v3**



### Chapter 1: Sampling and Data

- 1.1 Statistics Terminology and Study Designs
- 1.1.1 Sampling and Parameters
  - Understand the definitions of population, sampling, statistic, parameter, and data
  - Identify stratified, cluster, systematic, and convenience sampling
- 1.1.2 Statistical Study Design
  - Identify and describe the steps in the statistical analysis process
  - Determine whether a study is observational or an experiment and appropriate use cases
- 1.2 Sampling Errors, Bias, and Measures of Data
- 1.2.1 Sampling Errors and Bias
  - Identify sampling errors and bias
  - Identify situations in which statistics can be misleading
- 1.2.2 Variables and Measures of Data

- Identify explanatory and response variables in an experiment
- Identify levels of measurement of data
- Define and distinguish between qualitative, quantitative, discrete, and continuous variables

## Chapter 2: Descriptive Statistics

- 2.1 Histograms and Frequency Tables Frequency Tables
- 2.1.1 Frequency Tables
  - Constructing and understanding frequency tables for a set of data
  - Construct and understand relative frequency tables for a set of data
  - Construct and understand cumulative relative frequency tables for a set of data
- 2.1.2 Histograms
  - Create and interpret histograms
- 2.1.3 Histograms and Frequency Tables for Grouped Data
  - Create and analyze histograms and frequency tables with grouped data
- 2.1.4 Extra Practice - Advanced Frequency Tables and Histograms for Grouped Data
  - Complete frequency tables and histograms to analyze grouped data
- 2.2 Histograms and Frequency Tables with Technology
- 2.2.1 Histograms and Frequency Tables with Technology - Calculator
  - Construct and understand frequency tables for a set of data with technology - Calculator
  - Construct and understand relative frequency tables for a set of data with technology - Calculator
  - Create and interpret histograms with technology - Calculator
- 2.2.2 Histograms and Frequency Tables with Grouped Data – Technology - Calculator
  - Create and analyze histograms and frequency tables with grouped data – Calculator
- 2.2.3 Histograms and Frequency Tables with Technology - Excel
  - Construct and understand frequency tables for a set of data with technology - Excel
  - Construct and understand relative frequency tables for a set of data with technology - Excel
  - Create and interpret histograms with technology - Excel
- 2.2.4 Histograms and Frequency Tables with Grouped Data – Technology - Excel
  - Create and analyze histograms and frequency tables with grouped data – Excel
- 2.3 Stem-and-leaf plots, Dot plots, and Line and Bar Graphs
- 2.3.1 Creating and Interpreting Stem-and-leaf plots and Dot plots
  - Create and interpret stem-and-leaf plots
  - Create and interpret dot plots
- 2.3.2 Line and Bar Graphs
  - Create and interpret bar graphs
  - Create and interpret line graphs of data

- 2.4 Dot plots, Line and Bar graphs with Technology
- 2.4.1 Dot plots, Line and Bar graphs with Technology - Calculator
  - Create and interpret dot plots with technology - Calculator
  - Create and interpret line and bar graphs of data with technology - Calculator
- 2.4.2 Dot plots, Line and Bar graphs with Technology - Excel
  - Create and interpret dot plots with technology - Excel
  - Create and interpret line and bar graphs of data with technology - Excel
- 2.5 Choose appropriate graphs to display data
- 2.5.1 Choose appropriate graphs to display data
  - Choose appropriate graphs and charts to display data
- 2.6 Measures of Central Tendency
- 2.6.1 Using Measures of Central Tendency
  - Find the mean of a set of data
  - Find the mean from a frequency table
  - Find the median of a set of data
  - Find the mode of a set of data
  - Determine whether the mean, median, or mode is the best measure of center for a data set
- 2.6.2 Quartiles and Box Plots
  - Find the five-number summary of a data set
  - Find and interpret percentiles and quartiles of a data set
  - Identify the interquartile range and potential outliers in a set of data
  - Construct and understand box-and-whisker plots
- 2.6.3 Skewness and Standard Deviation
  - Determine if a data set is skewed
  - Compute variance and standard deviation
  - Interpret the standard deviation of a set of data
  - Compute z-scores and use them to compare values from different data sets
- 2.6.4 Introduction to the Empirical Rule and Chebyshev's Theorem
  - Understand principles of the Empirical Rule
  - Understand principles of Chebyshev's Theorem
- 2.7 Measures of Center and Spread with Technology
- 2.7.1 Calculate measures of center and spread using Technology – Calculator
  - Calculate mean, median and mode for a dataset using Technology – Calculator
  - Create and interpret box and whisker plot using Technology - Calculator
- 2.7.2 Calculate measures of center and spread using Technology – Excel
  - Calculate mean, median and mode for a dataset using Technology – Excel
  - Create and interpret box and whisker plot using Technology - Excel
- 2.8 Calculate Variance and Standard Deviation with Technology
- 2.8.1 Variance, Standard Deviation and Z-scores with technology - Calculator
  - Compute the variance and standard deviation with technology - Calculator
  - Compute z-scores and use them to compare values from different data sets with technology - Calculator

- 2.8.2 Variance, Standard Deviation and Z-scores with technology - Excel
  - Compute the variance and standard deviation with technology - Excel
  - Compute z-scores and use them to compare values from different data sets with technology – Excel

## Chapter 3: Probability Topics

- 3.1 Intro to probability and probability rules
- 3.1.1 Introduction to probability
  - Define and explain probability terminology, likelihood and experiments
  - Use and, or, and not notation to describe events
  - Use a tree diagram to list outcomes and compute probabilities
- 3.1.2 Understanding Probability
  - Explain the role of probability in statistics
  - Describe and create basic probability distributions
- 3.1.3 Basic probability rules
  - Compute probability with equally likely outcomes
  - Describe more than one event
- 3.1.4 Types of Probability
  - Make and test predictions using empirical probability models
- 3.1.5 Complement and Addition Rules for probability
  - Use the addition rule for probabilities
  - Use the complement rule for probabilities
- 3.2 Intro to probability and probability rules
- 3.2.1 Mutually exclusive events
  - Understand mutually exclusive events
  - Use the addition rule for mutually exclusive event probabilities
  - Use the multiplication rule for independent event probabilities
- 3.2.2 Conditional probabilities
  - Use conditional probability notation to describe events
  - Create and interpret contingency tables to find probability
  - Use a Venn diagram to compute compound and conditional probabilities
- 3.2.3 Multiplication rule and Independent and mutually exclusive events
  - Use the multiplication rule for conditional probabilities
  - Distinguish between independent or mutually exclusive events given conditional probability information
- 3.3 Counting Principles
- 3.3.1 Counting principles
  - Understand and explain the fundamental counting principle
  - Counting with permutations
  - Counting with combinations

- 3.3.2 Counting to find Probability
  - Determine which probability method for a given context
  - Compute probability involving permutations and combinations
- 3.4 Odds and expected value
- 3.4.1 Odds and expected value
  - Compute odds using probability
  - Distinguish between risk and odds
  - Applications using expected value
  - Compute the expected value of an event

## Chapter 4: Discrete Random Variables

- 4.1 Discrete Probability Density Functions
- 4.1.1 Discrete Probability
  - Understand the properties of a discrete probability density function
  - Find the mean of a discrete random variable from its probability density function
  - Find the standard deviation of a discrete random variable from its probability density function
- 4.2 Distribution Types
- 4.2.1 Binomial Distribution
  - Understand the parameters of the binomial distribution
  - Find and visualize probabilities using the binomial distribution
  - Use the binomial distribution to compute probability
- 4.2.2 Poisson Distribution
  - Understand the parameters of the poisson distribution
  - Use the poisson distribution to compute probability
- 4.2.3 Geometric Distribution
  - Understand the geometric distribution and use it to compute probability
  - Compute the mean of a geometric distribution
- 4.3 Distribution Types with Technology
- 4.3.1 Distribution with Technology - Calculator
  - Calculate mean and standard deviation for a discrete probability distribution using Technology - Calculator
  - Create and interpret a Binomial Distribution with Technology - Calculator
  - Create and interpret a Poisson Distribution with Technology - Calculator
  - Create and interpret a Geometric Distribution with Technology - Calculator
- 4.3.2 Distribution with Technology - Excel
  - Calculate mean and standard deviation for a discrete probability distribution using Technology - Excel
  - Create and interpret a Binomial Distribution with Technology - Excel
  - Create and interpret a Poisson Distribution with Technology - Excel

- Create and interpret a Geometric Distribution with Technology - Excel

## Chapter 5: Continuous Random Variables

- **5.1 Basic Continuous Density Functions and Exponential Distribution**
- 5.1.1 Basic Continuous Density Functions
  - Use area under the curve to compute probability for continuous probability density functions
  - Use the uniform distribution to compute probability
  - Use the uniform distribution to compute conditional probability
  - Find the mean and standard deviation of the uniform distribution
- 5.1.2 Exponential Distribution
  - Understand the parameters of the exponential distribution
  - Use the exponential distribution to compute probability
  - Use the memoryless property of the exponential distribution to compute conditional probability
- **5.2 Continuous Density Functions and Exponential Distribution with Technology**
- 5.2.1 Continuous Density and Exponential Distribution with Technology - Calculator
  - Calculate and create the continuous density distribution with technology - Calculator
  - Calculate and create the exponential distribution with technology - Calculator
- 5.2.2 Continuous Density and Exponential Distribution with Technology - Excel
  - Calculate and create the continuous density distribution with technology - Excel
  - Calculate and create the exponential distribution with technology - Excel

## Chapter 6: The Normal Distribution

- **6.1 Parameters of the Normal Distribution and Probability Using the Normal Distribution**
- 6.1.1 Parameters of the Normal Distribution
  - Understand the notation and interpret the parameters of a normal distribution
  - Standardize a normally distributed random variable
  - Calculate the mean and standard deviation of a normal distribution
- 6.1.2 Probability Using the Normal Distribution
  - Use the empirical rule for normal distributions to estimate probability
  - Use the normal distribution to compute probability
  - Use the normal distribution to approximate the binomial
- **6.2 Using the Normal Distribution with Technology**
- 6.2.1 Using the Normal Distribution with Technology- Calculator
  - Use the normal distribution to compute probability with technology - Calculator
  - Use the normal distribution to compute a value for a random variable given probability - Calculator
  - Use the normal distribution to approximate the binomial with technology - Calculator

- 6.2.2 Using the Normal Distribution with Technology- Excel
  - Use the normal distribution to compute probability with technology - Excel
  - Use the normal distribution to compute a value for a random variable given probability - Excel
  - Use the normal distribution to approximate the binomial with technology - Excel

## Chapter 7: The Central Limit Theorem

- **7.1 The Central Limit Theorem**
- 7.1.1 Central Limit Theorem
  - Use the Central Limit Theorem for Means to find the sample mean and the sample standard deviation
  - Use the Central Limit Theorem for Sums to find the sample mean and sample standard deviation
  - Use both forms of the Central Limit Theorem to compute probability
- **7.2 Sampling Distributions and the Central Limit Theorem**
- 7.2.1 Central Limit Theorem for Means
  - Understand sampling distributions and the Central Limit Theorem for Means
- 7.2.2 Using the Central Limit Theorem for Means to Find Probability
  - Use the Central Limit Theorem for Means to find probabilities for sampling distributions
  - Use the Central Limit Theorem to find a mean given a probability
- 7.2.2-Calculator – Central Limit Theorem for Means
  - Use the Central Limit Theorem for Means to find probabilities for sampling distributions - Calculator
  - Use the Central Limit Theorem to find a mean given a probability - Calculator
- 7.2.2–Excel Central Limit Theorem for Means with Technology
  - Use the Central Limit Theorem for Means to find probabilities for sampling distributions - Excel
  - Use the Central Limit Theorem to find a mean given a probability - Excel
- 7.2.3 Understanding effect of sample size for Means
  - Understand the effect of sample size on sampling distributions for Means
- **7.3 Central Limit Theorem for Proportions**
- 7.3.1 Central Limit Theorem for Proportions – Understand Sampling Distributions
  - Understand sampling distributions and the Central Limit Theorem for Proportions
- 7.3.2 Using Central Limit Theorem for Proportions to find Probability
  - Use the Central Limit Theorem for Proportions to find probabilities for sampling distributions
  - Use the Central Limit Theorem to find a proportion given a probability
- 7.3.2-Calculator – Central Limit Theorem for Proportion

- Use the Central Limit Theorem for Proportions to find probabilities for sampling distributions - Calculator
- Use the Central Limit Theorem to find a proportion given a probability - Calculator
- 7.3.2-Excel: Central Limit Theorem for Proportion
  - Use the Central Limit Theorem for Proportions to find probabilities for sampling distributions - Excel
  - Use the Central Limit Theorem to find a proportion given a probability - Excel
- 7.3.3 Understand effect of sample size for Proportion
  - Understand the effect of sample size on sampling distributions for Proportions

## Chapter 8: Confidence Intervals

- **8.1 Confidence Intervals**
- 8.1.1 Confidence Intervals
  - Point estimates, margins of error, and confidence intervals
  - Calculate a margin of error given a confidence interval
  - Calculate a point estimate given a confidence interval
  - Generate a confidence interval using the empirical rule
- 8.1.2 Understanding Confidence Intervals
  - Understand and compare confidence intervals in context
- **8.2 Confidence Interval for Population Mean - Standard Deviation Known**
- 8.2.1 Confidence Interval for Population Mean- Population Standard Deviation Known
  - Find the z-score given the confidence level
  - Calculate the margin of error for a confidence interval for a mean (standard deviation known)
  - Calculate and interpret the confidence interval for a population mean with a known standard deviation
  - Find the sample size required to estimate a population mean with a given confidence level
- 8.2.1-Calculator: Confidence Interval for Population Mean- Population Standard Deviation Known with Technology
  - Find the z-score given the confidence level - Calculator
  - Calculate the margin of error for a confidence interval for a mean (standard deviation known) - Calculator
  - Calculate and interpret the confidence interval for a population mean with a known standard deviation - Calculator
  - Find the sample size required to estimate a population mean with a given confidence level - Calculator
- 8.2.2-Calculator: Calculate a Confidence Interval for the Mean, population standard deviation known - Datasets
  - Calculate a Confidence Interval for the Mean, population standard deviation known - Calculator



- 8.2.1-Excel: Confidence Interval for Population Mean- Population Standard Deviation Known with technology
  - Find the z-score given the confidence level - Excel
  - Calculate the margin of error for a confidence interval for a mean (standard deviation known) - Excel
  - Calculate and interpret the confidence interval for a population mean with a known standard deviation - Excel
  - Find the sample size required to estimate a population mean with a given confidence level - Excel
- 8.2.2-Excel - Calculate a Confidence Interval for the Mean, population standard deviation known - Datasets
  - Calculate a Confidence Interval for the Mean, population standard deviation known - Excel
- **8.3 Confidence Interval for Population Mean - Standard Deviation Unknown**
- 8.3.1Confidence Interval for Population Mean- Population Standard Deviation Unknown
  - Determine the degrees of freedom to find and interpret the t-score of a normally distributed random variable
  - Calculate a confidence interval for a population mean (standard deviation unknown)
- 8.3.1-Calculator: Confidence Interval for Population Mean- Population Standard Deviation Unknown with technology
  - Determine the degrees of freedom to find and interpret the t-score of a normally distributed random variable - Calculator
  - Calculate a confidence interval for a population mean (standard deviation unknown) - Calculator
- 8.3.2-Calculator: Calculate a Confidence Interval for the Mean, population standard deviation unknown
  - Calculate a Confidence Interval for the Mean, population standard deviation unknown - Calculator
- 8.3.1-Excel: Confidence Interval for Population Mean- Population Standard Deviation Unknown with technology
  - Determine the degrees of freedom to find and interpret the t-score of a normally distributed random variable - Excel
  - Calculate a confidence interval for a population mean (standard deviation unknown) - Excel
- 8.3.2-Excel: Calculate a Confidence Interval for the Mean, population standard deviation unknown
  - Calculate a Confidence Interval for the Mean, population standard deviation unknown - Excel
- 8.4 Confidence Intervals for Population Proportion
- 8.4.1 Calculate the mean and standard deviation of the sampling distribution
  - Calculate the mean and standard deviation of the sampling distribution of sample proportions

- 8.4.2 Confidence Intervals for Population Proportion
  - Calculate the margin of error for Confidence Intervals for a proportion
  - Calculate and interpret the confidence interval for a population proportion
  - Calculate the sample size required to estimate a population proportion with a given confidence level
  - Calculate a “plus-four” confidence interval for a population proportion
- 8.4.2-Calculator: Confidence Intervals for Population Proportion with Technology
  - Calculate and interpret the confidence interval for a population proportion - Calculator
  - Calculate the sample size required to estimate a population proportion with a given confidence level - Calculator
  - Calculate a “plus-four” confidence interval for a population proportion - Calculator
- 8.4.3-Calculator: Calculate a Confidence Interval for a Proportion
  - Calculate a Confidence Interval for a Proportion - Calculator
- 8.4.2-Excel: Confidence Intervals for Population Proportion with Technology
  - Calculate and interpret the confidence interval for a population proportion - Excel
  - Calculate the sample size required to estimate a population proportion with a given confidence level - Excel
  - Calculate a “plus-four” confidence interval for a population proportion - Excel
- 8.4.3-Excel: Calculate a Confidence Interval for a Proportion
  - Calculate a Confidence Interval for a Proportion - Excel
- **8.5 Confidence Intervals - Two Samples**
- 8.5.1 Confidence Intervals for Two Samples
  - Compute confidence interval for difference in population proportions and interpret the interval in context
- 8.5.1-Calculator: Confidence Intervals for Two Samples with Technology
  - Compute confidence interval for difference in population proportions and interpret the interval in context – Calculator
- 8.5.1-Excel Confidence Intervals for Two Samples
  - Compute confidence interval for difference in population proportions and interpret the interval in context - Excel
- 8.5.2: Confidence intervals for difference in population means
  - Compute confidence intervals for the difference in population means

## Chapter 9: Hypothesis Testing for One Population

### 9.1 Introduction to Hypothesis Testing

- 9.1.1 Terminology and Process of hypothesis testing
  - Understand key terminology and concepts in hypothesis testing
  - Understand the process of hypothesis testing
- 9.1.2 Basics of hypothesis testing

- Identifying the null and alternative hypothesis
  - Identify and explain differences between one- and two-tailed hypotheses tests
- 9.1.3 Understanding significance levels, critical values, and test statistics
  - Understanding the significance level and rejection region
  - Understand and interpret critical values
  - Understand and interpret the test-statistic and p-value
- 9.1.4 Analyzing hypothesis tests in research
  - Analyze a hypothesis test and make conclusions
- **9.2 Developing Hypothesis and understanding Possible Conclusions**
- 9.2.1 Developing Hypothesis and understanding Possible Conclusions
  - Identify the null and alternative hypotheses for an experiment with one population mean
  - Distinguish between one- and two-tailed hypotheses tests and understand possible conclusions
  - Differentiate between Type I and Type II errors when performing a hypothesis test
- 9.2.2 Calculate the Test Statistic – One Mean Hypothesis Test
  - Compute the value of the test statistic (z-value) for a hypothesis test for one population mean with a known standard deviation
- **9.3 Conducting Hypothesis test for mean – population standard deviation known**
- 9.3.1 Conduct a Hypothesis Test for Mean – Population Standard Deviation Known - Critical Value/Rejection Region Approach
  - Determine the critical value(s) of a one-mean z-test at a given significance level to define a rejection region
  - Make a conclusion and interpret the results of a one-mean hypothesis test using the Critical Value Approach with a known standard deviation
- 9.3.2 Complete the steps of a one-mean hypothesis testing with Population SD known - Critical Value Approach
  - Complete the steps of a one-mean hypothesis test with Population SD known - Critical Value approach
- 9.3.3 Conduct a Hypothesis Test for Mean - Population Standard Deviation Known: P-Value Approach
  - Determine the p-value for a hypothesis test for the mean (population standard deviation known)
  - Make a conclusion and interpret the results of a one-mean hypothesis test (population standard deviation known) using the P-Value Approach
- 9.3.4 Complete the steps of a one-mean hypothesis testing with Population SD known - P-Value approach
  - Complete the steps of a one-mean hypothesis test with Population SD known - P-Value approach
- 9.3.4-Calculator Hypothesis Testing with Technology - SD Known
  - Perform and interpret a hypothesis test for the mean, population standard deviation known using Technology - Calculator

- 9.3.4-Excel: Hypothesis Testing with Technology - SD Known
  - Perform and interpret a hypothesis test for the mean, population standard deviation known using Technology - Excel
- **9.4 Hypothesis Test for the Mean - Population Standard Deviation Unknown**
- 9.4.1 Compute the value of the test statistic (t-value) and degrees of freedom for a hypothesis test for one population mean with an unknown population standard deviation
  - Compute the value of the test statistic (t-value) and degrees of freedom for a hypothesis test for one population mean with an unknown population standard deviation
- 9.4.2 Conduct a Hypothesis Test for Mean – Population Standard Deviation Unknown - Critical Value/Rejection Region Approach
  - **Determine the critical value(s) for a hypothesis test for the mean (population standard deviation unknown)**
  - Make a conclusion and interpret the results of a one-mean hypothesis test (population standard deviation unknown) using the Critical Value/Rejection Region Approach
- 9.4.3 Complete the steps of a one-mean hypothesis test with Population SD unknown - Critical Value Approach
  - Complete the steps of a one-mean hypothesis test with Population SD unknown - Critical Value approach
- 9.4.4 Conduct a Hypothesis Test for Mean - Population Standard Deviation Unknown: P-Value Approach
  - Determine the p-value for a hypothesis test for the mean (population standard deviation unknown)
  - Make a conclusion and interpret the results of a one-mean hypothesis test (population standard deviation unknown) using the P-Value Approach
- 9.4.5 Complete the steps of a one-mean hypothesis test with Population SD unknown - P-Value Approach
  - Complete the steps of a one-mean hypothesis test with Population SD unknown - P-Value approach
- 9.4.5-Calculator: Hypothesis testing with technology - SD unknown
  - Perform and interpret a hypothesis test for the mean, population standard deviation unknown using Technology - Calculator
- 9.4.5-Excel: Hypothesis testing with technology - SD unknown
  - Perform and interpret a hypothesis test for the mean, population standard deviation unknown using Technology - Excel
- **9.5 Introduction to Hypothesis Test for Proportion**
- 9.5.1 Developing Hypothesis and understanding Possible Conclusions
  - Identify the null and alternative hypotheses for an experiment with one population proportion
- 9.5.2 Compute the Test Statistic - Hypothesis Test for Proportion
  - Compute the value of the test statistic (z-value) for a hypothesis test for proportion

- **9.6 Conducting Hypothesis test for Proportion**
- 9.6.1 Conduct a Hypothesis Test for Proportion – Critical Value/Rejection Region Approach
  - Determine the critical value(s) for a hypothesis test for the proportion in order to define rejection region(s)
  - Make a conclusion and interpret the results of a hypothesis test for a proportion using the Critical Value/Rejection Region Approach
- 9.6.2 Complete the steps of a Hypothesis Test for Proportion – Critical Value Approach
  - Complete the steps of a Hypothesis Test for Proportion – Critical Value Approach
- 9.6.3 Conduct a Hypothesis Test for Proportion - P-Value Approach
  - Determine the p-value for a hypothesis test for proportion
  - Make a conclusion and interpret the results for a hypothesis test for proportion using the P-Value Approach
- 9.6.4 Complete the steps of a Hypothesis Test for Proportion – P-Value Approach
  - Complete the steps of a Hypothesis Test for Proportion – P-Value Approach
- 9.6.4-Calculator: Hypothesis Testing with Technology – Proportion
  - Perform and interpret a hypothesis test for a proportion using Technology - Calculator
- 9.6.4-Excel: Hypothesis Testing with Technology – Proportion
  - Perform and interpret a hypothesis test for a proportion using Technology - Excel

## **Chapter 10 Hypothesis Testing with Two Populations**

### 10.1 Two-Mean Hypothesis Tests – Independent Samples - Population Standard Deviations Known

- 10.1.1 Two-Mean Hypothesis Test with Population Standard Deviations Known
  - Identify null and alternative hypothesis for testing the difference between two means - independent samples - population standard deviations known
- 10.1.2 Calculate the test statistic
  - Calculate test statistic for testing the difference between two means (z value) - population standard deviations known
- 10.1.3 Two-Mean Hypothesis Test - Population Standard Deviations Known - Critical Value/Rejection Region Approach
  - Determine the critical value(s) for a hypothesis test for the difference between two means (population standard deviations known) in order to define rejection region(s)
  - Make a conclusion and interpret the results for testing the difference between two means (population standard deviations known) using the Critical Value/Rejection Region Approach
- 10.1.4 Complete the steps of a two-mean hypothesis testing with Population SD known - critical value approach

- Complete the steps of a two-mean hypothesis test with Population SD known - critical value approach
- 10.1.5 Two-Mean Hypothesis Test - Population Standard Deviation Known - P-Value Approach
  - Determine the p-value for a hypothesis test for the difference between two means (population standard deviations known)
  - Make a conclusion and interpret the results for testing the difference between two means (population standard deviation known) using the P-Value Approach
- 10.1.6 Complete the steps of a two-mean hypothesis testing with Population SD known-p-val approach
  - Complete the steps of a two-mean hypothesis test with Population SD known - P-val approach
- 10.1.6-Calculator: Perform and Interpret a Two-Mean Hypothesis Test (population SD known) with Technology
  - Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations known) with Technology - Calculator
- 10.1.6-Excel: Perform and Interpret a Two-Mean Hypothesis Test (population SD known) with Technology
  - Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations known) with Technology – Excel

## 10.2 Two-Mean Hypothesis Tests – Independent Samples - Population Standard Deviations Unknown

- 10.2.1 Two-Mean Hypothesis Tests with Population Standard Deviations Unknown
  - Identify and understand the null and alternative hypotheses for an experiment with two population means
- 10.2.2 Calculate the Test Statistic – Two-Mean Hypothesis Test
  - Calculate the test statistic (t-value) for a two-mean hypothesis test for population variances assumed equal (pooled estimate of the standard deviation)
  - Calculate the test statistic (t-value) for a two-mean hypothesis test for population variances assumed unequal (nonpooled estimate of the standard deviation)
- 10.2.3 Degrees of Freedom – Two-Mean Hypothesis Test
  - Determine the degrees of freedom for a two-mean hypothesis test for population variances assumed equal (pooled estimate of the standard deviation)
  - Determine the degrees of freedom for a two-mean hypothesis test for population variances assumed unequal (nonpooled estimate of the standard deviation)
- 10.2.4 Conducting a Two-Mean Hypothesis Tests - Population Standard Deviation Unknown - Critical Value/Rejection Region Approach

- Determine the critical value(s) for a hypothesis test for the difference between two means (population standard deviations unknown) in order to define rejection region(s)
- Make a conclusion and interpret the results for testing the difference between two means (population standard deviations unknown) using the Critical Value/Rejection Region Approach
- 10.2.5 Complete the steps of a two-mean hypothesis testing with Population SD unknown-critical value approach
  - Complete the steps of a two-mean hypothesis test with Population SD unknown-critical value approach
- 10.2.6 Conducting a Two-Mean Hypothesis Tests - Population Standard Deviation Unknown - P-Value Approach
  - Determine the p-value for a hypothesis test for the difference between two means (population standard deviations unknown)
  - Make a conclusion and interpret the results for testing the difference between two means (population standard deviation unknown) using the P-Value Approach
- 10.2.7 Complete the steps of a two-mean hypothesis testing with Population SD unknown-P-value approach
  - Complete the steps of a two-mean hypothesis test with Population SD unknown-P-value approach
- 10.2.7-Calculator: Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations unknown) with Technology
  - Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations unknown) with Technology - Calculator
- 10.2.7-Excel: Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations unknown) with Technology
  - Perform and Interpret a Two-Mean Hypothesis Test (population standard deviations unknown) with Technology – Excel

### 10.3 Two Mean Hypothesis Tests (Dependent Samples)

- 10.3.1 Two Mean Hypothesis Tests (Dependent Samples)
  - Identify dependent samples versus independent samples
  - Identify the null and alternative hypothesis involving the hypothesized mean of the differences for the paired data
- 10.3.2 Calculate the Test Statistic and Degrees of Freedom - Dependent Samples
  - Calculate the test statistic (t-value) and degrees of freedom for a hypothesis test for the differences of paired data (dependent samples)
- 10.3.3 Two Mean Hypothesis Tests (Dependent Samples) - Critical Value/Rejection Region Approach
  - Determine the critical value(s) for a hypothesis test for the mean of the differences for the paired data in order to define rejection region(s)

- Make a conclusion and interpret the results for testing the difference between means for paired data (dependent samples) using the Critical Value/Rejection Region Approach
- 10.3.4 Complete the steps of a Two Mean Hypothesis Tests (Dependent Samples) - critical value approach
  - Complete the steps of a Two Mean Hypothesis Tests (Dependent Samples) - critical value approach
- 10.3.5 Two Mean Hypothesis Tests (Dependent Samples) - P-Value Approach
  - Determine the P-value for a hypothesis test for the mean of the differences for the paired data
  - Make a conclusion and interpret the results for testing the difference between means for paired data (dependent samples) using the P-Value Approach
- 10.3.6 Complete the steps of a Two Mean Hypothesis Tests (Dependent Samples) - P-Value Approach
  - Complete the steps of a Two Mean Hypothesis Tests (Dependent Samples) - P-Value Approach
- 10.3.6-Calculator: Perform and Interpret a Hypothesis Test for Dependent (paired data) with Technology
  - Perform and Interpret a Hypothesis Test for Dependent (paired data) with Technology - Calculator
- 10.3.6-Excel: Perform and Interpret a Hypothesis Test for Dependent (paired data) with Technology - Excel
  - Perform and Interpret a Hypothesis Test for Dependent (paired data) with Technology - Excel

#### 10.4 Two population hypothesis test for proportions (Independent Samples)

- 10.4.1 Two population hypothesis test for proportions (Independent Samples)
  - Identify the null and alternative hypotheses for a hypothesis test to test the difference between two population proportions
  - Confirm the conditions are satisfied to use a z-test for the hypothesis test to test the difference between two population proportions
- 10.4.2 Calculate the Test Statistic - Independent Samples
  - Compute the value of the test statistic (z-value) for a hypothesis test to test the difference between two population proportions
- 10.4.3 Two population hypothesis test for proportions (Independent Samples) - Critical Value/Rejection Region Approach
  - Determine the critical value(s) for a hypothesis test to test the difference between two population proportions in order to define rejection region(s)
  - Make a conclusion and interpret the results for a hypothesis test to test the difference between two population proportions using the Critical Value/Rejection Region Approach



- 10.4.4 Complete the steps of a Two population hypothesis test for proportions (Independent Samples) - Critical Value/Rejection Region Approach
  - Complete the steps of a Two population hypothesis test for proportions (Independent Samples) - Critical Value/Rejection Region Approach
- 10.4.5 Two population hypothesis test for proportions (Independent Samples) - P-Value Approach
  - Determine the p-value for a hypothesis test to test the difference between two population proportions
  - Make a conclusion and interpret the results for a hypothesis test to test the difference between two population proportions using the P-Value Approach
- 10.4.6 Complete the steps of a Two population hypothesis test for proportions (Independent Samples) - P-Value Approach
  - Complete the steps of a Two population hypothesis test for proportions (Independent Samples) - P-Value Approach
- 10.4.6-Calculator: Perform and Interpret a Two-Proportion Hypothesis Test with Technology
  - Perform and Interpret a Two-Proportion Hypothesis Test with Technology – Calculator
- 10.4.6-Excel: Perform and Interpret a Two-Proportion Hypothesis Test with Technology – Excel
  - Perform and Interpret a Two-Proportion Hypothesis Test with Technology - Excel

## **Chapter 11: Chi-Square Distributions**

### 11.1 Introduction to the Chi-Square Distribution

- 11.1.1 Introduction to Chi-Square Distribution
  - Understand the properties of the chi-square distribution
  - Distinguish between use cases of the chi-square tests

### 11.2 Chi-Square Tests

- 11.2.1 Chi-Square Goodness-of-Fit Test
  - Compute the value of the test statistic using the expected frequencies for a chi-square goodness-of-fit test
  - Conduct and interpret a chi-square goodness-of-fit test
- 11.2.2 Chi-Square Independence Test
  - Compute the value of the test statistic using the expected frequencies for a chi-square independence test
  - Conduct and interpret a test of independence with the chi-square distribution
- 11.2.3 Chi-Square Homogeneity Test
  - Compute the value of the test statistic using the expected frequencies for a chi-square homogeneity test

- Conduct and interpret a test for homogeneity with the chi-square distribution

## **Chapter 12 - Linear Regression**

### 12.1 Linear Regression Equations

- 12.1.1 Linear Regression Equations and Application
  - Understand properties of linear equations
  - Understand the relationship between scatter plots and tables and determine patterns
  - Find the linear regression equation given a list of data points
- 12.1.2 Uses of Linear Regression
  - Find and interpret the correlation coefficient
  - Identifying the line of best fit (Least Squares Regression)
  - Make predictions using a line of best fit
- 12.1.3 Outliers and Prediction Errors
  - Find outliers in a data set
  - Determine the prediction errors for data values and trend lines
- 12.1.4 Correlation and Causation
  - Interpret the slope and y-intercept of the least squares regression line
  - Understand the difference between correlation and causation
- 12.1.5 Coefficient of Determination
  - Compute and interpret the sums of squares representing total, explained, and unexplained variation among y-values
  - Compute and interpret the coefficient of determination

### 12.2 Linear Regression with Technology

- 12.2.1-Calculator: Performing Linear Regressions with Technology
  - Calculate the correlation coefficient using Technology - Calculator
  - Determine the best fit linear regression equation using Technology - Calculator
- 12.2.1-Excel: Performing Linear Regressions with Technology
  - Calculate the correlation coefficient using Technology - Excel
  - Determine the best fit linear regression equation using Technology - Excel

### **12.3 Recognizing Multivariate Relationships**

- 12.3.1 Multivariate Relationships
  - Identify applications where multiple regression can be performed
  - Define the format for a multiple regression equation

- Make predictions using the multiple regression equation

#### 12.4 Multivariate Relationships with Technology

- 12.4.1-Calculator: Applying technology to determine the multiple regression equation with technology
  - Determine the multiple regression equation using Technology - Calculator
- 12.4.1-Excel: Applying technology to determine the multiple regression equation with technology
  - Determine the multiple regression equation using Technology - Excel

### **Chapter 13: Introduction to ANOVA tests**

#### 13.1 Setting up the one-way ANOVA test

- 13.1.1 Setting up the one-way ANOVA test
  - Determine appropriate situations for a one-way ANOVA test and identify the null and alternative hypotheses
  - Determine the degrees of freedom for the numerator and denominator for one-way ANOVA test

#### 13.2 Conduct a one-way ANOVA test - Critical Value Approach

- 13.2.1 Conduct a one-way ANOVA test - Critical Value Approach
  - Determine the critical value and rejection region for one-way ANOVA test
- 13.2.2 Calculate the Test Statistic - One-Way ANOVA
  - Calculate the test statistic for one-way ANOVA test

#### 13.3 Performing an ANOVA test with Technology - Critical Value Method

- 13.3.1-Calculator: Performing an ANOVA test with Technology - Critical Value Method
  - Make a decision for the hypothesis test using critical value/rejection region method and interpret results – Calculator
- 13.3.1-Excel: Performing an ANOVA test with Technology - Critical Value Method
  - Make a decision for the hypothesis test using critical value/rejection region method and interpret results – Excel

#### 13.4 Performing an ANOVA test with Technology – P-Value Approach

- 13.4.1-Calculator: Performing an ANOVA test with Technology – P-Value Approach
  - Make a decision for the hypothesis test using the p-value method and interpret results – Calculator
- 13.4.1-Excel: Performing an ANOVA test with Technology – P-Value Approach
  - Make a decision for the hypothesis test using the p-value method and interpret results – Excel

