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Statistics, v3

Source	Author(s) (Text or Video)	Title(s)	Link (where applicable)
OpenStax	Barbara Illowsky, De Anza College Susan Dean, De Anza College	Introductory Statistics	OpenStax
www.onlinestatbook.com	David Lane Developed by Rice University, University of Houston Clear Lake, and Tufts University	Online Statistics Education: An Interactive Multimedia Course of Study	Online Stat Book
JB Statistics	Jeremy Balka, University of Guelph		YouTube Channel

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

- 10.3.1 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