

StaGlen Ridge Public Schools –Mathematics Curriculum



Course Title: PROBABILITY AND STATISTICS

Subject: Mathematics

Grade Level: 11 - 12

Duration: Full Year

Prerequisite: Successful completion of Algebra II

Elective or Required: Elective

Mathematics Mission Statement

Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

Course Description:

In this course, students will learn the concepts that serve as the foundation for the study of probability and statistics. They will explore the process of data collection and analysis and expand their understanding of the role of statistics in making inferences from data. Applications from many realistic contexts such as business and economics, the social and physical sciences, healthcare, education, engineering and sports will be examined throughout the course of the year. Students will learn how fields outside mathematics use statistics to analyze and interpret data to make informed decisions. Students will be exposed to four broad conceptual themes:

- | | |
|---------------------------|---|
| 1. Exploring Data: | Observing patterns and departures from patterns |
| 2. Planning a Study: | Deciding what and how to measure |
| 3. Anticipating Patterns: | Producing models using probability and simulation |
| 4. Statistical Inference: | Confirming models. |

Technology such as the TI 83/84 graphing calculators will be used daily and will enhance the depth of particular topics thereby lessening the drudgery of hand calculations. All students will be required to have a graphing calculator.

Primary Textbook: Statistics and Probability with Applications, Starnes & Tabor

Author: Catherine McCarthy

Date Submitted: Summer 2017

PROBABILITY & STATISTICS

I Analyzing One-Variable Data

Approximate # Of Weeks: 4

Essential Questions:

- How does one define statistics?
- How does a graph enhance the display of data?
- How does one know which graph is appropriate to use for a given set of data?
- Why does one need to analyze the spread of data?
- How can technology be helpful in the study of statistics?
- What information does a graph reveal about a data?
- Why is shape, center, and spread in a univariate data set important?

New Jersey Student Learning Standards: S-ID # 1, 2, 3, & 5

Upon completion of this unit students will be able to:

- Identify the individuals and variables in a data set, then classify variables as categorical or quantitative.
- Summarize the distribution of a variable with a frequency table or a relative frequency table
- Construct and interpret bar charts of categorical data
- Interpret pie charts
- Identify what makes some graphs of categorical data deceptive
- Construct and interpret dotplots of quantitative data
- Describe the shape of a distribution
- Compare distributions of quantitative data with dotplots
- Construct stemplots of quantitative data
- Interpret stemplots
- Compare distributions of quantitative data with stemplots
- Construct histograms of quantitative data
- Interpret histograms
- Compare distributions of quantitative data with histograms
- Find and interpret the median of a distribution of quantitative data

- Calculate the mean of a distribution of quantitative data
- Compare the mean and median of a distribution, and choose the more appropriate measure of center in a given setting
- Find the range of a distribution of quantitative data
- Find and interpret the interquartile range
- Calculate and interpret the standard deviation
- Use the 1.5 X IQR rule to identify outliers
- Construct and interpret boxplots of quantitative data
- Compare distributions of quantitative data with boxplots
- Find and interpret a percentile in a distribution of quantitative data
- Estimate percentiles and individual values using a cumulative relative frequency graph
- Find and interpret a standardized score (z-score) in a distribution of quantitative data

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century
- Standard 9.3 Career Awareness, Exploration, and Preparation

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Chapter 1 Project: Stats Applied
- Lab Activities: Motivating Shape, Center, Outliers and Variability
 - The "1 in 6" Game
 - Mean as a "Balance Point"
 - Did Mr. Starnes Stack his Class?

Enrichment Activities:

- Video Unit 1: What Is Statistics? (6:23)
<http://www.learner.org/courses/againstallodds/unitpages/unit01.html>
- Video Unit 2: Stemplots (11:49)
<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>
- Video Unit 3: Histograms (9:41)
<http://www.learner.org/courses/againstallodds/unitpages/unit03.html>
- Video Unit 4: Measures of Center (8:50)
<http://www.learner.org/courses/againstallodds/unitpages/unit04.html>
- Video Unit 6: Standard Deviation (9:07)
<http://www.learner.org/courses/againstallodds/unitpages/unit06.html>
- Video Unit 5: Boxplots (9:06)
<http://www.learner.org/courses/againstallodds/unitpages/unit05.html>
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazine and Newspaper articles
- Statistical Applets as referenced in textbook
- Annenberg-Learner Video Series: Against All Odds
- Graphing Calculator

Learning Goals Scale:

- 4 The student will design and analyze appropriate graphical and descriptive summaries for a given set of data
- 3 The student will compare and contrast the graphs of distributions of data
- 2 The student will interpret a distribution of data for its center, shape, spread and outliers or gaps
- 1 The student will read a graphical display for its important characteristics

II Analyzing Two-Variable Quantitative Data

Approximate # Of Weeks: 4

Essential Questions:

- How can we assess the association between two categorical variables?
- How do we numerically and graphically describe the relationship between two quantitative variables?
- What is regression analysis?
- What are the benefits of using an equation to model data?
- How does one know how well a regression equation models a set of data?
- What are the properties of a linear regression model?

New Jersey Student Learning Standards: S-ID # 4

Upon completion of this unit students will be able to:

- Distinguish between explanatory and response variables for categorical data
- Make a segmented bar chart to display the relationship between two categorical variables
- Determine if there is an association between two categorical variables and describe the association if it exists
- Distinguish between explanatory and response variables for quantitative data
- Make a scatterplot to display the relationship between two quantitative variables with the calculator
- Describe the direction, form, and strength of a relationship displayed in a scatterplot, and identify outliers
- Estimate the correlation between two quantitative variables from a scatterplot
- Interpret the correlation
- Distinguish correlation from causation
- Calculate the correlation between two quantitative variables with use of technology
- Apply the properties of the correlation
- Describe how outliers influence the correlation
- Make predictions using regression lines, keeping in mind the dangers of extrapolation
- Calculate and interpret a residual

- Interpret the slope and y intercept of a regression line
- Calculate the equations of the least-squares regression line using technology
- Calculate the equation of the least-squares regression line using summary statistics
- Describe how outliers affect the least-squares regression line
- Use a residual plot to determine whether a regression model is appropriate
- Interpret the standard deviation of the residuals
- Interpret r^2
- Use technology to calculate quadratic models for curved relationships, then construct and interpret residual plot
- Use technology to calculate exponential models for curved relationships, then construct and interpret residual plot
- Use residual plots to determine the most appropriate regression model

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- The Guess the Correlation applet
<http://www.rossmanchance.com/applets/GuessCorrelation.html>
- The Least-Squares Regression applet
<http://www.rossmanchance.com/applets/RegShuffle.htm>
- Lab activity: Introducing the QCR

Enrichment Activities:

- Video Unit 13: Two-Way Tables (10:24) [Use with Lesson 2.1]
<http://www.learner.org/courses/againstallodds/unitpages/unit13.html>

- Video Unit 10: Scatterplots (8:59) [Use with Lesson 2.2]
<http://www.learner.org/courses/againstallodds/unitpages/unit10.html>
- Video Unit 12: Correlation (10:50) [Use with Lesson 2.3 & 2.4]
<http://www.learner.org/courses/againstallodds/unitpages/unit12.html>
- Video Unit 11: Fitting Lines to Data (10:45) [Use with Lesson 2.5 & 2.6]
<http://www.learner.org/courses/againstallodds/unitpages/unit11.html>
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazine and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Learner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will analyze bivariate data for correlation and patterns to solve real world problems
- 3 The student will interpret slope and y-intercept of a regression model in context of real world problems
- 2 The student will construct appropriate regression model for bivariate data with the use of technology

- 1 The student will use a calculator to construct scatterplot and identify if a linear model is appropriate

III Collecting Data

Approximate # Of Weeks: 4

Essential Questions:

- How do we collect data?
- How do we avoid bias?
- How can causation be established?
- What considerations should be made when designing an experiment?
- What are the parts of a well-designed experiment?
- What cautions about experimentation exist?

New Jersey Student Learning Standards: S-ID #5, 6a, 6b, 6c, 7, 8, 9

Upon completion of this unit students will be able to:

- Distinguish statistical questions from other types of questions
- Identify the population and sample in a statistical study
- Distinguish between an observational study and an experiment
- Describe how convenience sampling can lead to bias
- Describe how voluntary response sampling can lead to bias
- Explain how random sampling can help to avoid bias
- Describe how obtain a simple random sample using slips of paper or technology
- Explain the concept of sampling variability and the effect of increasing sample size
- Use simulation to test a claim about a population proportion
- Use simulation to approximate the margin of error for a sample proportion and interpret the margin of error
- Use simulation to approximate the margin of error for a sample mean and interpret the margin of error
- Explain how undercoverage can lead to bias
- Explain how nonresponse can lead to bias
- Explain how other aspects of a sample survey can lead to bias
- Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions
- Explain the purpose of comparison in an experiment
- Describe the placebo effect and the purpose of blinding in an experiment
- Describe how to randomly assign treatments using slips of paper or technology
- Explain the purpose of random assignment in an experiment
- Identify sources of variability in an experiment and explain the benefits of keeping these variables the same for all experimental units
- Outline an experiment that uses a completely randomized design
- Explain the concept of statistical significance in the context of an experiment

- Use simulation to determine if the difference between two means or two proportions in an experiment is significant
- Identify when it is appropriate to use information from a sample to make an inference about a population and when it is appropriate to make an inference about cause and effect
- Evaluate if a statistical study has been carried out in an ethical manner

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Lab Activities: Geography Quiz
Show Me the Money

Enrichment Activities:

- Video Unit 16: Census and Sampling (9:44) [Use after Lesson 3.2]
(<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>)
- Video Unit 17: Samples and Surveys (10:05) [Use after Lesson 3.4]
(<http://www.learner.org/courses/againstallodds/unitpages/unit17.html>)
- Video Unit 14: The Question of Causation (14:05) [Use after Lesson 3.5]
(<http://www.learner.org/courses/againstallodds/unitpages/unit03.html>)
- Video Unit 15: Designing Experiments (11:11) [Use after Lesson 3.6]
(<http://www.learner.org/courses/againstallodds/unitpages/unit15.html>)
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e

- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website:
highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazine and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Learner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will design an appropriate study to answer a given research question
- 3 The student will evaluate the effectiveness of different sampling and experimental design techniques
- 2 The student will collect and appropriately display data for a given real world problem
- 1 The student will state and identify the different methods of gathering data

IV Probability

Approximate # Of Weeks: 4

Essential Questions:

- What is randomness?

- How is probability used in real life?
- What is a Probability Distribution?
- How can the rules of probability be used to answer questions and make predictions?
- What is a Probability Model and how is it used in the real world?
- How can we compute and express probabilities in simple and complex situations?

New Jersey Student Learning Standards: S-ID # 1, 2, S-CP # 1-9

Upon completion of this unit students will be able to:

- Interpret probability as a long-run relative frequency
- Dispel common myths about randomness
- Use simulation to model chance behavior
- Give a probability model for a chance process with equally likely outcomes and use it to find the probability of an event
- Use the complement rule to find probabilities
- Use the addition rule for mutually exclusive events to find probabilities
- Use a two-way table to find probabilities
- Calculate probabilities with the general addition rule
- Use Venn Diagram to find probabilities
- Find and interpret conditional probabilities using two-way tables
- Use the conditional probability formula to calculate probabilities
- Determine whether two events are independent
- Use the general multiplication rule to calculate probabilities
- Use a tree diagram to model a chance process involving a sequence of outcomes
- Calculate conditional probabilities using tree diagrams
- Use the multiplication rule for independent events to calculate probabilities
- Calculate the probability of “at least one” using the complement rule and the multiplication rule for independent events
- Determine if it is appropriate to use the multiplication rule for independent events in a given setting
- Use the multiplication counting principle to determine the number of ways to complete a process involving several steps
- Use factorials to count the number of permutations of a group of individuals
- Compute the number of permutations of a group of individuals
- Compute the number of permutations of n individuals taken k at a time
- Use combinations to calculate probabilities
- Use the multiplication counting principle and combinations to calculate probabilities

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education

- Standard 6.3 Active Citizenship in the 21st Century
- Standard 5.1 Science Practices A & B

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Ted Talks: Peter Donnelly: *How juries are fooled by statistics*
The last banana: A thought experiment in probability
- Lab Activities: Promotion Discrimination
The Last Banana

Enrichment Activities:

- Video Unit 18: Introduction to Probability (11:20) [Use after Lesson 4.1]
(<http://www.learner.org/courses/againstallodds/unitpages/unit18.html>)
- Video Unit 19: Probability Models (10:33) [Use after Lesson 4.6]
(<http://www.learner.org/courses/againstallodds/unitpages/unit19.html>)
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website

- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazine and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Learner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will analyze and solve real world problems with appropriate probability strategies
- 3 The student will differentiate the basic definitions and rules of probability including the Complement Rule, the Addition Rule, the Multiplication Rule
- 2 The student will solve routine probability problems
- 1 The student will calculate of the number of ways an event may occur using an appropriate counting method

V Random Variables

Approximate # Of Weeks: 3

Essential Questions:

- What is a Random Variable?
- What is a Probability Distribution for a Random Variable?
- How does one identify a Binomial Variable?
- How are Binomial Probability models used?
- What is a normal distribution?
- What does a normal distribution imply about the spread of data?

New Jersey Student Learning Standards: S-MD # 1-4, 5Aa, 5b, S-ID #4

Upon completion of this unit students will be able to:

- Verify that the probability distribution of a discrete random variable is valid
- Calculate probabilities involving a discrete random variable
- Classify a random variable as discrete or continuous
- Make a histogram to display the probability distribution of a discrete random variable and describe its shape
- Calculate and interpret the mean (expected value) of a discrete random variable

- Calculate and interpret the standard deviation of a discrete random variable
- Determine whether or not a given scenario is a binomial setting
- Calculate probabilities involving a single value of a binomial random variable
- Make a histogram to display a binomial distribution and describe its shape
- Calculate and interpret the mean and standard deviation of a binomial distribution
- Find probabilities involving several values of a binomial random variable
- Use technology to calculate cumulative binomial probabilities
- Show that the probability distribution of a continuous random variable is valid and use the distribution to calculate probabilities
- Determine the relative locations of the mean and median for a continuous random variable from the shape of its probability distribution
- Draw a normal probability distribution with a given mean and standard deviation
- Use the 68-95-99.7 rule to find approximate probabilities in a normal distribution
- Use Table A to find a probability (area) from a z-score in the standard normal distribution
- Use Table A to find a z-score from a probability in the standard normal distribution
- Calculate the probability that a value falls within a given interval in a normal distribution using a calculator
- Find a value corresponding to a given probability in a normal distribution using a calculator

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.

- The Normal Probability Calculator applet
<http://www.rossmanchance.com/applets/NormCalc.html>
- Lab Activity: SMELLING PARKINSON'S DISEASE

Enrichment Activities:

- Video Unit 20: Random Variables (11:09) [Use after Lesson 5.2]
<http://www.learner.org/courses/againstallodds/unitpages/unit20.html>
- Video Unit 21: Binomial Distributions (11:28) [Use after Lesson 5.3]
<http://www.learner.org/courses/againstallodds/unitpages/unit21.html>
- Video Unit 7: Normal Curves (12:08) [Use after Lesson 5.6]
<http://www.learner.org/courses/againstallodds/unitpages/unit07.html>
- Video Unit 8: Normal Calculations (12:49) [Use with Lesson 5.6]
<http://www.learner.org/courses/againstallodds/unitpages/unit08.html>
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazines and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Lerner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will analyze real world situations so as to interpret the mean and standard deviation of random variables
- 3 The student will appropriately use either the Binomial or Normal model to calculate and interpret probabilities
- 2 The student will calculate the expected value (mean) and standard deviation for the distribution of discrete random variables
- 1 The student will specify the probability model for the distribution of a discrete random variable

VI Sampling Distributions**Approximate # Of Weeks: 5****Essential Questions:**

- How do Statistics Vary?
- What is a Sampling Distribution?
- How does one model the distribution of sample proportions and means?
- What is the Central Limit Theorem?

New Jersey Student Learning Standards: S-MD # 1-4, 5Aa, 5b, S-IC #1, 3, 4**Upon completion of this unit students will be able to:**

- Distinguish between a parameter and a statistic.
- Create a sampling distribution using all possible samples from a small population.
- Use the sampling distribution of a statistic to evaluate a claim about a parameter.
- Determine if a statistic is an unbiased estimator of a population parameter.
- Describe the relationship between sample size and the variability of a statistic.
- Calculate the mean and the standard deviation of the sampling distribution of a sample count and interpret the standard deviation.
- Determine if the sampling distribution of a sample count is approximately normal.
- Calculate the mean and standard deviation of the sampling distribution of a sample proportion \hat{p} and interpret the standard deviation.
- Determine if the sampling distribution of \hat{p} is approximately normal.
- If appropriate, use a normal distribution to calculate probabilities involving \hat{p} .
- Find the mean and standard deviation of the sampling distribution of a sample mean \bar{x} and interpret the standard deviation.
- Use a normal distribution to calculate probabilities involving \bar{x} when sampling from a normal population.
- Determine if the sampling distribution of \bar{x} is approximately normal when sampling from a non-normal population.
- If appropriate, use a normal distribution to calculate probabilities involving \bar{x} .

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills

- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Lab Activities: Bubbafish Activity
Dueling Dice
Did You Get Enough Blues?

Enrichment Activities:

- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e
- Video # 22: Sampling Distributions
<http://www.learner.org/courses/againstallodds/unitpages/unit22.html>

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations

- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazines and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Lerner Video Series: Against All Odds

Learning Goal Scales:

- 4 The student will analyze a data distribution and apply the appropriate sampling model to solve probability questions
- 3 The student will determine if a sampling distribution is approximately Normal
- 2 The student will calculate the mean and standard deviation of a sampling distribution
- 1 The student will define what is meant by the sampling distribution of proportions or means

VII Estimating a Parameter

Approximate # Of Weeks: 3

Essential Questions:

- What does it mean to make an inference?
- How do we use statistics to estimate parameters?
- What is a margin of error?
- What is a confidence interval?

New Jersey Student Learning Standards: S-IC # 1, 2, 4, 5, 6, & S-MD # 6, 7

Upon completion of this unit students will be able to:

- Interpret a confidence interval in context.
- Determine the point estimate and margin of error from a confidence interval.
- Use confidence intervals to make decisions.
- Interpret a confidence level in context.
- Describe how the confidence level and sample size affect the margin of error.
- Explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval.
- Check the Random and Large Counts conditions for constructing a confidence interval for a population proportion.

- Determine the critical value for calculating a C% confidence interval for a population proportion using technology.
- Calculate a C% confidence interval for a population proportion using a calculator
- Interpret a confidence interval for a population proportion.
- Determine the sample size required to obtain a C% confidence interval for a population proportion with a specified margin of error.
- State and check the Random and Normal/Large Sample conditions for constructing a confidence interval for a population mean.
- Determine critical values for calculating a C% confidence interval for a population mean.
- Calculate a C% confidence interval for a population mean using a calculator
- Use sample data to check the Normal/Large Sample condition.
- Interpret a confidence interval for a population mean.

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century
- Standard 5.1 Science Practices

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Applet: Simulating Confidence Intervals for a Population Parameter (<http://www.rossmanchance.com/applets/ConfSim.html>)
- Lab Activities: Reese's Pieces Samples
Nitrogen in Tires-a Lot of Hot Air?

Enrichment Activities:

- Video Unit 28: Inference for Proportions (<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>)

- Video Unit 26: Small Sample Inference for One Mean
(<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>)
- Video Unit 24: Confidence Intervals (10:02)
(<http://www.learner.org/courses/againstallodds/unitpages/unit24.html>)
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through on the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazines and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Learner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will analyze a real world problem and use a confidence interval to answer questions
- 3 The student will explain the difference between t and Normal distributions
- 2 The student will calculate the margin of error for a confidence interval
- 1 The student will use a calculator to find an appropriate confidence interval for a population mean or proportion

VIII Testing a Claim

Approximate # Of Weeks: 4

Essential Questions:

- How and why do we test statistics?
- How do we distinguish between the Null and Alternative Hypotheses?
- What is a “p-value”?
- How do we make decisions using significance tests?
- How do we organize a significance test for either a population proportion or mean?

New Jersey Student Learning Standards: S-IC # 1, 2, 5, 6 & S-MD # 6, 7

Upon completion of this unit students will be able to:

- State appropriate hypotheses for a significance test about a population parameter.
- Interpret a P-value in context.
- Make an appropriate conclusion for a significance test based on a P-value.
- Determine if the results of a study are statistically significant and make an appropriate conclusion using a significance level.
- Interpret a Type I error and a Type II error in context.
- Give a consequence of a Type I error and a Type II error in a given setting.
- Check the Random and Large Counts conditions for performing a significance test about a population proportion.
- Calculate the standardized test statistic for a significance test about a population proportion.
- Find the P-value for a one-sided significance test about a population proportion using technology.
- Perform a one-sided significance test about a population proportion using technology.
- Calculate the P-value for a two-sided significance test about a population proportion using technology.
- Perform a two-sided significance test about a population proportion using technology.
- Check the Random and Normal/Large Sample conditions for performing a significance test about a population mean.
- Calculate the standardized test statistic for a significance test about a population mean.
- Find the P-value for a significance test about a population mean using technology.
- Perform a significance test about a population mean using technology.
- Use a confidence interval to draw a conclusion about a two-sided test for a population mean.

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills

- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century
- Standard 5.1 Science Practices

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- The Practice of Statistics 5th Edition Applets: The Reasoning of a Statistical Test
(http://digitalfirst.bfwpub.com/stats_applet/stats_applet_15_reasoning.html)
- Lab Activities: Spinner Bases
Flipping More Kisses
A-Massing More Snickers

Enrichment Activities:

- Video Unit 26: Small Sample Inference for One Mean
(<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>)
- Video Unit 25: Test of Significance
(<http://www.learner.org/courses/againstallodds/unitpages/unit25.html>)
- Video Unit 28: Inference for Proportions
(<http://www.learner.org/courses/againstallodds/unitpages/unit02.html>)
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions

- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher’s Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazines and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Learner Video Series: Against All Odds

Learning Goal Scale:

- 4** The student will analyze the results of a study to determine if they are statistically significant and draw an appropriate conclusion using a reasonable significance level
- 3** The student will interpret the “p” value of a test
- 2** The student will use a calculator to conduct a significance test for a claim
- 1** The student will state the null and alternative hypothesis for a significance test

IX Inference for Categorical Variable Relationships

Approximate # Of Weeks: 3

Essential Questions:

- How do we test relationships among categorical variables?
- Can we use a normal or t-distribution to conduct a Chi-Square Test?
- What are the steps in conducting a Chi-Square Test?

New Jersey Student Learning Standards: S-IC # 1, 2, 5, 6 & S-MD # 7

Upon completion of this unit students will be able to:

- State hypotheses for a test about the distribution of a categorical variable.
- Calculate expected counts for a test about the distribution of a categorical variable.

- Calculate the test statistic for a test about the distribution of a categorical variable.
- Check conditions for a test about the distribution of a categorical variable.
- Calculate the P-value for a test about the distribution of a categorical variable with technology.
- Perform a chi-square test for goodness of fit with technology.
- State hypotheses for a test about the relationship between two categorical variables.
- Calculate expected counts for a test about the relationship between two categorical variables.
- Calculate the test statistic for a test about the relationship between two categorical variables.
- Check conditions for a test about the relationship between two categorical variables.
- Calculate the P-value for a test about the relationship between two categorical variables with technology.
- Perform a chi-square test for association with technology.

Interdisciplinary Standards

- Standard 9.1 21st-Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 8.2 Technology Education
- Standard 6.3 Active Citizenship in the 21st Century
- Standard 5.1 Science Practices

Activities:

- Assignments and announcements will be delivered through Google Classroom
- Smartboard Lessons and powerpoint presentations will be used to relay notes to students
- Students will read and study material presented in course textbook and then be challenged with questions about their reading through examples.
- Students will take notes on instructor's lecture and participate in class discussions.
- Students will navigate through the chapter to access tutorial video clips, step-by-step worked out solutions to selected problems, and on-line practice quizzes.
- Instructor will provide opportunity for both guided and independent practice.
- Homework assignments will be discussed to insure a good understanding of the prerequisites.
- Technology: the graphing calculator will be integrated into various exercises to help the student visualize and solve the problems.
- Students will be asked to make conclusions after working through explorations scattered throughout the unit.
- Lab Activities: M&M Color Distribution Lab
Do dogs Resemble Their Owners?
Walking It Off

Enrichment Activities:

- Video Unit 29: Inference for Two-Way Tables
(<http://www.learner.org/courses/againstallodds/unitpages/unit29.html>)
- Students may access tutorial videos keyed to the student text through the textbook's website: highschool.bfwpub.com/spa3e
- Students may access worked out examples, exercises and detailed key-stroke-level instructional videos through the textbook's website: highschool.bfwpub.com/spa3e

Methods of Assessments/Evaluation:

- Written quizzes and unit test
- Worksheets
- Responses to discussion questions
- Homework
- Classwork
- Verbal Assessment
- Think/Pair/Share
- Exit slips
- Self- Assessment exercises as found on textbook website
- Independent extra credit assignments
- Observations
- Peer Editing-Grading

Resources/Including Online Resources

- Teacher Webpage
- Textbook website: highschool.bfwpub.com/spa3e
- Google Classroom
- Statistical Websites as referenced in textbook
- Teacher's Resource Flashdrive (where lab activity handouts may be found unless otherwise specified)
- Magazines and Newspaper articles
- Statistical Applets as referenced in textbook
- Graphing Calculator
- Annenberg-Lerner Video Series: Against All Odds

Learning Goal Scale:

- 4 The student will analyze data in a two-way table and conduct a Chi-Squared significance test to solve real world problems
- 3 The student will use a calculator to conduct a Chi-Squared significance test
- 2 The student will understand how to find the expected counts for a Chi-Square significance test using a calculator.
- 1 The student will state the Null and Alternative Hypotheses for a Chi-Square significance test.