Randolph Township Schools
Randolph High School

AP Statistics Curriculum

"By a small sample, we may judge of the whole piece."
- Miguel de Cervantes from Don Quixote

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Mission Statement

We commit to inspiring and empowering all students in Randolph schools to reach their full potential as unique, responsible and educated members of a global society.

Affirmative Action Statement
Equality and Equity in Curriculum

The Randolph Township School district ensures that the district's curriculum and instruction are aligned to the state's standards. The curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

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EDUCATIONAL GOALS
VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization, which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:

- The needs of the child come first
- Mutual respect and trust are the cornerstones of a learning community
- The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members
- A successful learning community communicates honestly and openly in a non-threatening environment
- Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways
- Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences
- Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth

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Introduction

AP Statistics is an elective course in the STEM department for students who have completed Algebra II. It introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will become familiar with the vocabulary, methodology, and meaning in the statistics which exist in the world around them. Through this course, students will become critical consumers of published conclusions based on statistical analysis and become aware of the ways in which statistics can be improperly used to mislead, confuse, or distort the truth. Toward this end, the course makes use of technology to analyze and evaluate real-world data and provides students opportunities to incorporate their knowledge and interest in other disciplines into project work. In addition to gaining skills necessary to produce, analyze, model and draw conclusions from data, students will work to produce convincing oral and written statistical arguments, using appropriate terminology in a variety of settings. The course prepares students to take the College Board's AP Statistics Exam.

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Curriculum Pacing Chart

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
3 weeks	I	Collecting Data
6 weeks	II	Exploring One-Variable Data
3 weeks	III	Exploring Two-Variable Data
6 weeks	IV	Probability, Random Variables, and Probability Distributions
2 weeks	V	Sampling Distributions
7 weeks	VI	Inference for Proportions and Means
2 weeks	VII	Inference for Categorical Data: Chi-Square
1 week	VIII	Inference for Quantitative Data: Slopes
2 weeks	IX	AP Exam Preparation
4 weeks	X	Individualized Learning Projects

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Unit I: Collecting Data

TRANSFER: Students will analyze statistical studies, critique experimental designs and identify potential sources of bias as a means of assessing the overall validity of reported results.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved (not assessed). 1.B Identify key and relevant information to answer a question or solve a problem. 1.C Describe an appropriate method for gathering and representing data. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. **NJSLS – Math Standards:** S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	Well-designed experiments can establish evidence of causal relationships.	What does our data tell us?
	The way we collect data influences what we can and cannot say about a population.	Why might the data we collect not be valid for drawing conclusions about an entire population?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	Methods for data collection that do not rely on chance result in untrustworthy conclusions. There are two types of observational studies, retrospective and prospective, in which treatments are not imposed.	Evaluate data collection methods. Determine sources of bias. Refine data collection methods. Explain the difference between retrospective and prospective observational studies. Compare sampling and observational studies.

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Unit I: Collecting Data

S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S-IC.B.6 Evaluate reports based on data.	In an experiment, different conditions are assigned to experimental units.	Differentiate between control and experimental groups. Identify a process as a sample, experiment, or observational study.
	It is only appropriate to generalize about a population based on samples that are randomly selected or otherwise representative of the population from which it was selected.	Identify appropriate generalizations and determinations based on observational studies.
	There are four types of sampling that are effective in different situations: simple random sample, stratified, cluster, and systematic. A census selects all items/subjects in a population.	Identify a sampling method given a description of a study.
	Bias occurs when certain responses are systematically favored over others. Sources include voluntary response bias, nonresponse bias, response bias, and under coverage.	Identify potential sources of bias in sampling methods. Differentiate the different sources of bias given a sample.
	There are many parts in the design of an effective and valid experiment including: experimental units, explanatory variables (factors), treatments, response variables, confounding variables, blinding, and placebos and their effects.	Identify the components of a well-designed experiment.

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	A well-designed experiment should include the following: random assignment, replication, and control of potential confounding variables. There are three experimental designs that are appropriate in different settings: completely randomized design, blocked design, and matched pair design. Statistically significant differences between or among experimental treatment groups are evidence that the treatments caused the effect. **VOCABULARY:** census, simple random sample, stratified random sample, cluster sample, systematic sample, convenience sample, observational study, experiment, treatment, factor, level, response variable, placebo, blinding, response bias, under coverage, voluntary response bias, nonresponse bias, control, replication, completely randomized design, blocked design, matched pairs design, statistically significant	Describe the elements of random assignment, replication, and control of a well-designed experiment. Compare experimental designs and methods. Explain why a chosen experimental design is appropriate. Interpret the results of a well-designed experiment.

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Unit I: Collecting Data

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.
- Designing their own experiment to gather appropriate data with a focus on proper experimental design.

KEY LEARNING EVENTS AND INSTRUCTION:

- Corn Simulation – This allows students to understand the benefits of simple random sample with experimental design by simulating how much crop will be harvested with different sampling methods.
- Sampling Bias Activity – Students write their own survey questions, biased and unbiased, analyzing the impact of a variety of biases.
- Helicopter Activity – This experiment uses two types of paper helicopters. Students collect data on flight times and analyze the results to make conclusions.
- Odd One Out – In groups of four, students are given descriptions of four statistical studies, three of the same type. Students are tasked with determining which one is different and explaining why.

SUGGESTED TIME ALLOTMENT	3 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 4 **Chapter 4 FRQs** 2013 #2, 2011 #3, 2011B #2, 2010 #1, 2010B #2, 2009 #3, 2008 #2, 2007 #2, 2007B #3, 2006 #5, 2006B #5, 2005 #1, 2004 #2, 2004B #2, 2003 #4, 2002 #2, 2002B #3, 2001 #4, 2000 #5, 1999 #3, 1997 #2 Albert.io

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Unit II: Exploring One Variable Data

TRANSFER: Students will be able to analyze any data display in the news or on the Internet and draw conclusions about the variables of interest to assess the validity of an argument.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 2.A Describe data presented numerically or graphically. 2.B Construct numerical or graphical representations or distributions. 2.C Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response. 2.D Compare distributions or relative positions of points within a distribution. 3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. **NJSLS – Math Standards:** S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).	Graphical representations and statistics allow us to identify and represent key features of data. Given that variation may be random or not, conclusions are uncertain. **<u>KNOWLEDGE</u>** **Students will know:** A variable is a characteristic that changes from one individual to another. The two types of variables are categorical and quantitative. A frequency table gives the number of cases falling into each category. A relative frequency table gives the proportion of cases falling into each category. Counts and relative frequencies of categorical data reveal information that can be used to justify claims about the data in context.	How certain are we that what seems to be a pattern is not just a coincidence? Is my cat old, compared to other cats? **<u>SKILLS</u>** **Students will be able to:** Identify variables in a set of data. Classify types of variables. Represent categorical data using frequency or relative frequency tables. Describe categorical data using frequency or relative frequency tables.

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Unit II: Exploring One Variable Data

S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	Bar charts (or bar graphs) are used to display frequencies (counts) or relative frequencies (proportions) for categorical data.	Represent categorical data graphically.
	Graphical representations of a categorical variable reveal information that can be used to justify claims about the data in context.	Describe categorical data from given graphs.
	Frequency tables, bar graphs, or other representations can be used to compare two or more data sets in terms of the same categorical variable.	Compare multiple sets of categorical data.
	There are two types of quantitative data: discrete and continuous.	Classify types of quantitative variables.
	There are multiple ways to display quantitative data that show different characteristics of the distributions including histograms, stem plots, dot plots, box plots, and cumulative frequency plots (ogives).	Represent quantitative data graphically.
	Descriptions of the distribution of quantitative data include shape, center, and variability (spread), as well as any unusual features such as outliers, gaps, clusters, or multiple peaks.	Describe the characteristics of quantitative data distributions.
	The mean is the sum of all the data values divided by the number of values.	Calculate the mean for quantitative data.

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	The median of a data set is the middle value when data are ordered. When the number of data points is even, the median can take on any value between the two middle values.	Calculate the median for quantitative data.
	Three commonly used measures of variability (or spread) in a distribution are the range, interquartile range, and standard deviation.	Calculate measures of variability for quantitative data.
	Changing units of measurement and the presence of outliers affects the values of the calculated statistics.	Determine how outliers affect statistics.
	The method for determining outliers is finding the upper and lower fences.	Calculate the boundaries for an outlier.
	Taken together, the minimum data value, the first quartile (Q1), the median, the third quartile (Q3), and the maximum data value make up the five-number summary.	Use a five-number summary to create a boxplot for quantitative data.
	Any of the graphical representations or numerical summaries can be used to compare two or more independent samples on center, variability, clusters, gaps, outliers, and other features.	Compare graphical representations and summary statistics for multiple sets of quantitative data.
	Some sets of data may be described as approximately normally distributed. A normal curve is mound-shaped and symmetric.	Compare a data distribution to the normal distribution model.

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	Percentiles and z-scores may be used to compare relative positions of points within a data set or between data sets.	Compare measures of relative position in data sets.
	The 68-95-99.7% Rule (Empirical Rule) is an approximation for the amount of data within one, two, and three standard deviations of a Normal distribution.	Use the Empirical Rule to estimate proportions of a Normal distribution.
	Technology or a standard Normal table can be used to compute Normal calculations.	Calculate the proportion of data values located on a given interval in a Normal distribution. Estimate parameters for some populations given the area under a Normal curve.
	VOCABULARY: categorical, quantitative, bar chart, pie chart, segmented bar chart, histogram, dot plot, stem plot, box plot, mean, median, standard deviation, IQR (interquartile range), z-score, percentile, symmetric, skewed, outliers, standard normal model, empirical rule, five-number summary, SOCS (Shape, Outliers, Center, Spread)	

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Unit II: Exploring One Variable Data

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.
- Writing a report based on an experiment and using graphical and numerical summaries to make conclusions.

KEY LEARNING EVENTS AND INSTRUCTION:

- Gallery Walk – Students create and share dot plot, stem-and-leaf plot, histogram, and/or boxplot; discuss what information can be more easily seen in each graph to review when it is better to use each type of graph.

SUGGESTED TIME ALLOTMENT	6 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 1 & 2 **Chapter 1 FRQs** 2011B #1, 2010B #1, 2007B #1, 2006 #1, 2005B #1, 2004 #1, 2002B #5, 2001 #1, 2000 #3 **Chapter 2 FRQs** 2011 #1, 2009B #1, 2008 #1, 2006B #1, 1997 #1 Albert.io Data Sets – kaggle.com Rossman Chance Applets - http://rossmanchance.com/applets/

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Unit III: Exploring Two Variable Data

TRANSFER: Students will be able to investigate and find patterns in data to determine a correlation between two variables of interest.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 2.A Describe data presented numerically or graphically. 2.B Construct numerical or graphical representations of distributions. 2.C Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response. 2.D Compare distributions or relative positions of points within a distribution. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. **NJSLS – Math Standards:** S-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S-ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.	Regression models may allow us to predict responses to changes in an explanatory variable.	How can you determine the effectiveness of a linear model that uses the number of cricket chirps per minute to predict temperature?
	Graphical representations and statistics allow us to identify and represent key features of data.	How might you represent incomes of individuals with and without a college degree to help describe similarities and/or differences between the two groups?
	Correlation does not imply causation.	Does the fact that the number of shark attacks increases with ice cream sales necessarily mean that ice cream sales cause shark attack?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	The following displays can be used to compare categorical distributions and determine if they are associated: side-by-side bar graphs, segments bar graphs, and two-way tables (contingency tables). Several statistics can be calculated for two-way tables including joint relative frequencies, marginal relative frequencies, and conditional relative frequencies.	Compare numerical and graphical representations for two categorical variables. Calculate statistics for two categorical variables.

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Unit III: Exploring Two Variable Data

S-ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.	Summary statistics for two categorical variables can be used to compare distributions and/or determine if variables are associated.	Compare statistics for two categorical variables.
S-ID.B.b Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.	Two quantitative variables are used to create a scatterplot.	Represent bivariate quantitative data using scatterplots.
S-ID.B.c Fit a linear function for a scatter plot that suggests a linear association.	A description of a scatter plot includes form, direction, strength, and unusual features.	Describe the characteristics of a scatter plot.
S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		
S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.	The correlation, *r*, gives the direction and quantifies the strength of the linear association between two quantitative variables.	Determine and interpret the correlation for a linear relationship.
S-ID.C.9 Distinguish between correlation and causation.	A perceived or real relationship between two variables does not mean that changes in one variable cause changes in the other. That is, correlation does not necessarily imply causation.	Differentiate between correlation and causation.
	The predicted response value, denoted by $\hat{y}$, is calculated as $\hat{y} = a + bx$, where *a* is the *y*-intercept and *b* is the slope of the regression line, and *x* is the value of the explanatory variable.	Calculate a predicted response value using a linear regression model.

Unit III: Exploring Two Variable Data

	Extrapolation is a danger to predicting values using linear regression.	Define extrapolation in context of a problem.
	The residual is the difference between the actual value and the predicted value.	Calculate and interpret residuals.
	A residual plot is a plot of residuals versus explanatory variable values or predicted response values.	Represent differences between measured and predicted responses using residual plots.
	Apparent randomness in a residual plot for a linear model is evidence of a linear form to the association between the variables.	Describe the form of association of bivariate data using residual plots.
	Using a least-squares regression line, the following can be interpreted in context: coefficient of determination, slope, and intercept.	Interpret parameters and coefficients for the least-squares regression line model.
	Influential points and outliers affect the coefficients for a linear regression model.	Identify influential points in regression.
	One or both quantitative variables can be transformed to straighten a scatter plot prior to performing linear regression.	Straighten a scatter plot using the exponential and power transformations. Calculate a predicted response using a least-squares regression line for a transformed data set.

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	VOCABULARY: scatterplot, direction, form, strength, influential point, residual, slope, intercept, residual plot, least squares regression line, correlation coefficient, coefficient of determination, marginal distribution, conditional distribution	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.
- Creating a poster showing scatterplots and interpretations using two variables of choice.

KEY LEARNING EVENTS AND INSTRUCTION:

- Hand Size vs. # of Starbursts Picked Up – Students create a scatterplot showing their hand size (cm) and how many pieces of candy they can pick up. This can be used to introduce scatterplots or review linear regression.
- Paper Doll Activity – Students create their own paper doll. Using the floor tiles as a coordinate plane, the class creates a scatterplot with their dolls. The students review aspects of linear regression.
- Reversing interpretations – Instead of asking students to interpret a residual, give them the residual and the equation of the least-squares regression line and ask them to make a prediction for a particular observation.

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Unit III: Exploring Two Variable Data

SUGGESTED TIME ALLOTMENT	3 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 3 **Chapter 3 FRQ** 2013 #6, 2012 #1, 2007B #4, 2005 #3, 2003B #1, 2002 #4, 2002B #1, 2000 #1, 1999 #1, 1998 #2, 1998 #4 Albert.io Guess the Correlation http://guessthecorrelation.com/ and http://istics.net/Correlations/ (matching)

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Unit IV: Probability, Random Variables, and Probability Distributions

TRANSFER: Students will investigate and find patterns in natural phenomena and model them mathematically to assess chance procedures.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 2.B Construct numerical or graphical representations of distributions. 3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations. 3.B Determine parameters for probability distributions. 3.C Describe probability distributions. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. **NJSLS – Math Standards:** S-CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). S-CP.A.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. S-CP.A.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A	Given that variation may be random or not, conclusions are uncertain.	How can an event be both random and predictable?
	Probability distributions may be used to model variation in populations.	What is the best way to represent a probability distribution?
	Simulation allows us to anticipate patterns in data.	About how many rolls of a fair six-sided die would we anticipate it taking to get three 1s?
	<u>KNOWLEDGE</u> **Students will know:**	**SKILLS** **Students will be able to:**
	Simulation is a way to model random events, such that simulated outcomes closely match real-world outcomes.	Estimate probabilities using simulation.
	There are formal rules to probability.	Calculate and interpret probabilities for events and their complements.
	Two events are mutually exclusive or disjointed if they cannot occur at the same time. So $P(A \cap B) = 0$.	Explain why two events are (or are not) mutually exclusive.
	Conditional probabilities can be calculated using the conditional formula or the general multiplication rule.	Calculate conditional probabilities.

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given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. S-CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. S-CP.B.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. S-CP.B.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. S-CP.B.8 Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. S-CP.B.9 Use permutations and combinations to compute probabilities of compound events and solve problems. S-MD.A.1 Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability	Independent probabilities can be calculated by multiplying probabilities together. The addition rule states that the probability that event A or event B or both will occur. A discrete random variable is a variable that can only take a countable number of values. Random variable parameters are affected by adding, subtracting, multiplying, and dividing constants. Independent random variables can be combined into a single distribution. Binomial situations arise when there are two outcomes for each trial and trials are independent. The number of trials is set, and the probability of success is constant.	Calculate probabilities for independent events. Calculate probabilities for the union of two events. Represent the probability distribution for a discrete random variable. Calculate and interpret parameters for a discrete random variable. Calculate parameters for linear transformations of random variables. Calculate the parameters when combining random variables. Calculate probabilities for a binomial distribution.

Unit IV: Probability, Random Variables, and Probability Distributions

distribution using the same graphical displays as for data distributions. S-MD.A.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. S-MD.A.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. S-MD.B.6 Use probabilities to make fair decisions. S-MD.B.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. S-MD.A.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. S-MD.B.5.a Find the expected payoff for a game of chance. S-MD.B.5.b Evaluate and compare strategies on the basis of expected values. S-MD.B.7 Analyze decisions and strategies using probability concepts.	If a random variable is binomial, its mean, μ_x, is np and its standard deviation, σ_x, is $\sqrt{np(1-p)}$. Geometry settings arise when there are two outcomes for each trial, trials are independent, the probability of success is constant, and there are an indefinite number of trials, seeking the first success. If a random variable is geometric, its mean, μ_x, is $\frac{1}{p}$ and its standard deviation,σ_x is $\sqrt{\frac{1-p}{p}}$. **VOCABULARY:** sample space, event, outcome, trial, independent, mutually exclusive, tree diagram, conditional, random variable, expected value, complement, Addition Rule, Multiplication Rule, Discrete, Continuous, binomial distribution, geometric distribution	Calculate and interpret parameters for a binomial distribution. Calculate probabilities for geometric random variables. Calculate and interpret parameters of a geometric distribution.

Unit IV: Probability, Random Variables, and Probability Distributions

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging self/peer-reflection through journal writing and feedback on free response questions.
- Error Analysis – Using an FRQ, provide students with several answers containing errors for each part. Provide some responses with incorrect notation, incorrect work, missing work, work that shows calculator commands only, an incorrect formula or approach, and an incorrect final answer – ask students to identify the errors.

KEY LEARNING EVENTS AND INSTRUCTION:

- Monty Hall Problem – Explore the Monty Hall dilemma by watching a clip of the show as well as commentary by Monty Hall. Students will then simulate rounds of the Monty Hall problem and determine if it is better to switch doors.
- "1 in 6" simulation – Using dice, students will see the likelihood that at least 3 out of 7 people would win a free soda if the company is stating that 1 in 6 people are winners.
- LeBron Free Throw activity (Binomial) – Simulation that will allow students to further develop the formulas for a binomial distribution for small and large sample sizes.
- Lucky Day Activity (Geometric) – Simulation that will allow students to further develop the formulas for a geometric distribution for small and large sample sizes as well as explain why there is never a standard deviation for the geometric model.
- Card Game Activity (Probability Model) – Simulation to develop the expected value of a random variable.

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Unit IV: Probability, Random Variables, and Probability Distributions

SUGGESTED TIME ALLOTMENT	5 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapters 5 & 6 **Chapter 5 FRQs** 2011 #2, 2009B #2, 2003B #2, 2001 #3, 1997 #3 **Chapter 6 FRQs** 2013 #3, 2012 #2, 2011B #3, 2010 #4, 2010B #3, 2008 #3, 2008 #5, 2006 #3, 2005 #2, 2005B #2, 2004 #3, 2004 #4, 2003 #3, 2002 #3, 2002B #2, 2001 #2, 1999 #4, 1999 #5, 1998 #6 Albert.io Rossman Chance Applets – http://rossmanchance.com/applets/

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Unit V: Sampling Distributions

TRANSFER: Students will analyze sample data and patterns of sample size to generalize about a population.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations. 3.B Determine parameters for probability distributions. 3.C Describe probability distributions. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. **NJSLS – Math Standards:** S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.	The normal distribution may be used to model variation.	How likely is it to get a value this large just by chance?
	Probabilistic reasoning allows us to anticipate patterns in data.	How can we anticipate patterns in the values of a statistic from one sample to another?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	A sampling distribution of a statistic is the distribution of values for the statistic for all possible samples of a given size from a given population.	Estimate sampling distributions using simulation.
	A sample statistic is a point estimator of the corresponding population parameter.	Explain why an estimator is or is not unbiased. Calculate estimates for a population parameter.
	Sampling distributions for proportions and means (and the differences between two proportions or means) have different parameters.	Determine parameters of a sampling distribution for sample proportions and means.

Unit V: Sampling Distributions

	Sampling distributions for proportions and means (and the differences between two proportions or means) are approximately normal if: • For proportions, at least 10 successes and failures are expected for each sample. • For means, the population distribution is approximately normal, or the Central Limit Theorem is invoked for each sample. **VOCABULARY:** Sampling distribution, point estimate, Central Limit Theorem, normal approximation, 10% condition, statistically significant	Determine parameters of a sampling distribution for differences between two proportions or means. Determine whether a sampling distribution for a sample proportion and mean can be described as approximately normal. Determine whether a sampling distribution for differences between two proportions or means can be described as approximately normal. Calculate and interpret probabilities and parameters for a sampling distribution for a sample proportion and mean. Calculate and interpret probabilities and parameters for a sampling distribution for the differences between two proportions or means.

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Unit V: Sampling Distributions

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.

KEY LEARNING EVENTS AND INSTRUCTION:

- German Tank Activity – This discovery activity allows students to create their own estimator to determine the number of cards in a paper bag. This mimics what happened in WWII when the Americans captured German tanks and estimated how many tanks the Germans had in all. This is an introduction to the concept of sampling distributions and point estimators.
- Reese's Pieces Discovery – This uses an applet from Rossman Chance to introduce sampling distributions of proportions in regard to their shape, center, and spread.
- Password style games – Students sit facing opposite sides of the room. Vocabulary words are projected and students facing the word, describe until the partner guesses the correct term. After half of the terms used, have students switch roles.

SUGGESTED TIME ALLOTMENT	2 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 7 **Chapter 7 FRQs** 2012 #6, 2010 #2, 2009 #2, 2008B #2, 2007 #3, 2007B #2, 2006 #3, 2004B #3, 1998 #1 Albert.io Rossman-Chance applets - http://rossmanchance.com/applets/

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Unit VI: Inference for Proportions and Means

TRANSFER: Students will express appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and attending to precision when making mathematical statements.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 1.D Identify an appropriate inference method for confidence intervals. 1.E Identify an appropriate inference method for significance tests. 1.F Identify null and alternative hypotheses. 3.D Construct a confidence interval, provided conditions for inference are met. 3.E Calculate a test statistic and find a *p*-value, provided conditions for inference are met. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. 4.C Verify that inference procedures apply in a given situation. 4.D Justify a claim based on a confidence interval.	The normal distribution may be used to model variation.	When can we use a normal distribution to perform inference calculations involving population proportions?
	An interval of values is used to estimate parameters and account for uncertainty.	How can we narrow the width of a confidence interval?
	Significance testing allows us to make decisions about hypotheses within a given context.	Why is it inappropriate to accept a hypothesis as true based on the results of statistical inference testing?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	When the population standard deviation is unknown, inference for means uses the *t*-distribution based on degrees of freedom. To estimate a population proportion, a one-proportion *z*-interval is created. To estimate a population mean, a one-sample *t*-interval is created.	Determine the degrees of freedom for a *t*-distribution for a given sample size. Describe *t*-distributions. Verify the conditions for calculating confidence intervals for population proportions and means.

Unit VI: Inference for Proportions and Means

4.E Justify a claim using a decision based on significance tests. **NJSLS – Math Standards:** S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S-IC.B.6 Evaluate reports based on data.	A confidence interval is a type of interval estimate, computed from the statistics of the observed data, that might contain the true value of an unknown population parameter. A margin of error describes how much a value of a sample statistic may vary from the value of the corresponding population parameter. Sample size effects on confidence intervals. Sample proportions and means can be used to test a claim about a population parameter using a one-proportion *z*-test or a one-sample *t*-test.	Calculate an appropriate confidence interval for population proportions and means. Interpret an appropriate confidence interval for population proportions and means. Determine the margin of error for a given sample size and an estimate for the sample size that will result in a given margin of error for a population proportion or mean. Identify the relationships between sample size, width of a confidence interval, confidence level, and margin of error for a population proportion. Identify the null and alternative hypotheses for population proportions and means. Verify the conditions for making statistical inferences when testing population proportions and means. Calculate an appropriate test statistic and *p*-value for population proportions and means. Interpret the *p*-value of a significance test for population proportions and means.

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Unit VI: Inference for Proportions and Means

	When reporting claims, statistics are reported according to specific guidelines.	Justify a claim about the population based on the results of a significance test for population proportions and means.
	Type I and Type II errors can be committed when performing hypothesis tests.	Define Type I and Type II errors. Differentiate between Type I and Type II errors. Identify and interpret Type I and Type II errors.
	The impact of a Type I or a Type II error depends upon the situation.	Analyze the context and determine the potential impact of Type I and Type II errors. Calculate the probability of Type I and Type II errors.
	To estimate a difference in population proportions, a two-proportion *z*-interval is created. To estimate a difference in population means, a two-sample *t*-interval is created.	Verify the conditions for calculating confidence intervals for a difference between population proportions and for a difference between population means. Calculate and interpret appropriate confidence intervals for a comparison of population proportions and for a comparison of population means.

Unit VI: Inference for Proportions and Means

	For a two-sample test for a difference of two proportions or means, the null hypothesis specifies a value of 0 for the difference in population proportions or means, indicating no difference or effect.	Identify the null and alternative hypotheses for a difference of two population proportions and for a difference of two population means. Verify the conditions for making statistical inferences when testing a difference of two population proportions and a difference of two population means. Calculate an appropriate test statistic for the difference of two population proportions or means. Interpret the *p*-value of a significance test for a difference of population proportions or means. Justify a claim about the population based on the results of a significance test for a difference in proportions or means.

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Unit VI: Inference for Proportions and Means

	VOCABULARY: Confidence interval, standard error, margin of error, critical value, confidence level, null hypothesis, alternative hypothesis, one-tailed, two-tailed, *p*-value, significance level, significance test, alpha, type I and type II errors, power, pooled proportion, *t*-distribution, degrees of freedom, Central Limit Theorem	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.
- Completing a project in which they determine who spends more on haircuts – males or females – by completing inferences for means.

KEY LEARNING EVENTS AND INSTRUCTION:

- Hershey Kiss Activity (proportions) – Students use Hershey Kisses to estimate the proportion that will land face up when tossed.
- Court Case Activity (two-sample) – Students use two-sample inference procedures to determine if there was racial discrimination in a fire fighter exam.
- Paper Airplanes (any means or proportions) – Students create their own paper airplanes and gather data on flight distance. They use two sample inference procedures to analyze the data.

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Unit VI: Inference for Proportions and Means

SUGGESTED TIME ALLOTMENT	7 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapters 8, 9, & 10 **Chapter 8 FRQs** 2013 #1, 2011 #6, 2011B #5, 2010 #3, 2010B #4, 2008B #3, 2005 #5, 2003 #6, 2003B #6, 2002 #1, 2002B #4, 2000 #2, 2000B #6 **Chapter 9 FRQs** 2012 #5, 2009 #6, 2009B #4, 2009B #5, 2008B #4, 2008B #6, 2007 #4, 2006B #4, 2006B #6, 2005 #4, 2005B #4, 2005B #6, 2004 #6, 2003 #1, 2003 #2, 2001 #5, 1999 #6, 1998 #5, 1997 #5 **Chapter 10 FRQs** 2013 #5, 2012 #3, 2012 #4, 2011 #4, 2010 #5, 2009 #4, 2009 #5, 2009B #3, 2009B #6, 2008 #4, 2008B #1, 2007 #1, 2007 #5, 2007B #5, 2006 #4, 2006B #2, 2005 #6, 2005B #3, 2004B #4, 2004B #5, 2004B #6, 2003B #3, 2003B #4, 2002 #5, 2002 #6, 2000 #4, 1997 #4 Albert.io

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Unit VII: Inference for Categorical Data: Chi-Square

TRANSFER: Students will make predictions about a population using sample data.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 1.E Identify an appropriate inference method for significance tests. 1.F Identify null and alternative hypotheses. 3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations. 3.C Describe probability distributions. 3.D Construct a confidence interval, provided conditions for inference are met. 3.E Calculate a test statistic and find a *p*-value, provided conditions for inference are met. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. 4.C Verify that inference procedures apply in a given situation. 4.D Justify a claim based on a confidence interval.	Given that variation may be random or not, conclusions are uncertain.	How does increasing the degrees of freedom influence the shape of the chi-square distribution?
	Significance testing allows us to make decisions about hypotheses within a particular context.	Why is it inappropriate to use statistical inference to justify a claim that there is no association between variables?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
	Chi-square distributions have positive values and are skewed right. Chi-square goodness-of-fit tests are used to test a claim about the distribution of a categorical variable in a population.	Describe chi-square distributions. Identify the null and alternative hypotheses in a test for a goodness-of-fit test. Calculate expected counts for the chi-square test for goodness of fit. Calculate the appropriate statistic and *p*-value for the chi-square test for goodness of fit. Justify a claim about the population based on the results of a chi-square test for goodness of fit.

Unit VII: Inference for Categorical Data: Chi-Square

4.E Justify a claim using a decision based on significance tests. **NJSLS – Math Standards:** S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S-IC.B.6 Evaluate reports based on data.	The expected count in a particular cell of a two-way table of categorical data can be calculated. Chi-square tests for independence and homogeneity use multiple categorical variables. **VOCABULARY:** chi-square, goodness of fit, degree of freedom, test for independence, test for homogeneity, observed and expected counts	Calculate expected counts for two-way tables of categorical data. Identify the null and alternative hypotheses for a chi-square test for homogeneity or independence. Calculate the appropriate statistic for a chi-square test for homogeneity or independence. Determine the *p*-value for a chi-square significance test for independence or homogeneity Justify a claim about the population for a test for independence or homogeneity.

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Unit VII: Inference for Categorical Data: Chi-Square

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.
- Creating their own situations in which Chi-square tests would be appropriate.

KEY LEARNING EVENTS AND INSTRUCTION:

- M&M Activity – Students use a package of M&Ms to determine if Mars is accurately reporting the percentage of each color.

SUGGESTED TIME ALLOTMENT	2 weeks
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 11 **Chapter 11 FRQs** 2013 #4, 2011B #4, 2010 #6, 2010B #5, 2009 #1, 2008 #5, 2006 #6, 2004 #5, 2003 #5, 2003B #5, 2002B #6, 1999 #2, 1998 #3 Albert.io

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Unit VIII: Inference for Quantitative Data: Slopes

TRANSFER: Students will examine and apply a variety of methods to accurately and efficiently solve problems.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 1.D Identify an appropriate inference method for confidence intervals. 1.E Identify an appropriate inference method for significance tests. 1.F Identify null and alternative hypotheses. 3.D Construct a confidence interval, provided conditions for inference are met. 3.E Calculate a test statistic and find a *p*-value, provided conditions for inference are met. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. 4.C Verify that inference procedures apply in a given situation. 4.D Justify a claim based on a confidence interval. 4.E Justify a claim using a decision based on significance tests.	Given that variation may be random or not, conclusions are uncertain.	How can there be variability in slope if the slope statistic is uniquely determined for a line of best fit?
	An interval of values should be used to estimate parameters, in order to account for uncertainty.	When is it appropriate to perform inference about the slope of a population regression line based on sample data?
	Significance testing allows us to make decisions about hypotheses within a particular context.	Why do we not conclude that there is no correlation between two variables based on the results of a statistical inference for slopes?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	There are five conditions that must be met to conduct an interval or test for the slope.	Verify the conditions to calculate confidence intervals for the slope of a regression model.
	The *t*-distribution is used to perform an inference on the slope.	Calculate an appropriate confidence interval for the slope of a regression model. Interpret an appropriate confidence interval for the slope of a regression model.

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Unit VIII: Inference for Quantitative Data: Slopes

NJSLS – Math Standards: S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. S-ID.B.6b Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology. S-ID.B.6c Fit a linear function for a scatter plot that suggests a linear association. S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S-IC.B.6 Evaluate reports based on data.	The null hypothesis for the slope states there is no linear relationship between the two variables. **VOCABULARY:** LINER, standard deviation of the slope, degrees of freedom, *t*-distribution	Write the null and alternative hypotheses for a significance test for the slope. Use a computer output to determine the test statistic and *p*-value for a significance test for a slope. Justify a claim about the population based on the results of a significance test for the slope of a regression model.

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Unit VIII: Inference for Quantitative Data: Slopes

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing a summative exam at the end of the unit or chapter.
- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.
- Engaging in self/peer-reflection through journal writing and feedback on free response questions.

KEY LEARNING EVENTS AND INSTRUCTION:

- Error analysis – Give students raw data on distance and cost to fly from their hometown to various major cities. Introduce questions justifying claim and error analysis, for example how can you refute a claim that the average cost per mile is $0.50 per mile if you believe it to be false?

SUGGESTED TIME ALLOTMENT	1 week
SUPPLEMENTAL UNIT RESOURCES	Textbook Chapter 12 **Chapter 12 FRQs** 2011 #5, 2011B #6, 2010B #6, 2008 #6, 2007 #6, 2007B #6, 2006 #2, 2005B #5, 2004B #1, 2001 #6, 1997 #6 Albert.io

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Unit IX: Exam Preparation

TRANSFER: Apply knowledge to successfully complete the AP exam.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the equation to be answered or problem to be solved. 1.B Identify key and relevant information to answer a question or solve a problem. 1.C Describe an appropriate method for gathering and representing data. 1.D Identify an appropriate inference method for confidence intervals. 1.E Identify an appropriate inference method for significance tests. 1.F Identify null and alternative hypotheses. 2.A Describe data presented numerically and graphically. 2.B Construct numerical or graphical representations of distributions. 2.C Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response. 2.D Compare distributions or relative positions of points within a distribution. 3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations.	A well-constructed statistical argument involves an understanding of the variables involved, numeric summaries, graphical displays and careful selection of an appropriate inference procedure.	How do we choose the correct inference procedure to test a statistical claim?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
	The fundamental skills and concepts of statistics as described in the above curriculum.	Write answers to free response questions that provide justification for each step in the process in addition to correct numeric answers. Effectively apply the knowledge and skills developed throughout the course to solve a variety of multiple choice and free response questions based on the above curriculum.

Unit IX: Exam Preparation

3.B Determine parameters for probability distributions. 3.C Describe probability distributions. 3.D Construct a confidence interval, provided conditions for inference are met. 3.E Calculate a test statistic and find a *p*-value, provided conditions for inference are met. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. 4.C Verify that inference procedures apply in a given situation. 4.D Justify a claim based on a confidence interval. 4.E Justify a claim using a decision based on significance tests.		

ASSESSMENT EVIDENCE: Students will show their learning by:

- Working through Albert.io assignments throughout the chapter as a form of formative assessment to gauge student understanding.
- Collaborating with peers and/or working individually on AP-style free response questions using the College Board rubrics.

KEY LEARNING EVENTS AND INSTRUCTION:

- Practice MC and FRQ sections

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Unit IX: Exam Preparation

SUGGESTED TIME ALLOTMENT	2 Weeks
SUPPLEMENTAL UNIT RESOURCES	Albert.io College Board released Free Response Questions https://apcentral.collegeboard.org/courses/ap-statistics/exam/past-exam-questions?course=ap-statistics Baron's AP Review or Princeton Review Books Reference Sheet – what's not on the AP review sheet https://www.wlwv.k12.or.us/cms/lib8/OR01001812/Centricity/Domain/2064/Review%20AP%20Stats.pdf Super Six Review Problems Khan Academy review

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Unit X: Individualized Learning Project

TRANSFER: Students will be able to take sample data and make meaningful inferences about a population of inference.

STANDARDS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
College Board Standards: 1.A Identify the question to be answered or problem to be solved. 1.B Identify key and relevant information to answer a question or solve a problem. 1.C Describe an appropriate method for gathering and representing data. 1.E Identify an appropriate inference method for significance tests. 1.F Identify null and alternative hypotheses. 3.E Calculate a test statistic and find a *p*-value, provided conditions for inference are met. 4.A Make an appropriate claim or draw an appropriate conclusion. 4.B Interpret statistical calculations and findings to assign meaning or assess a claim. 4.C Verify that inference procedures apply in a given situation. 4.E Justify a claim using a decision based on significance tests.	The techniques of statistical analysis are applicable to research questions in many areas.	What data can we collect to help answer questions and what techniques can be used to analyze them?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
	A collection of data from the student body can answer many questions about the population with analysis. The following will be completed: • Posing a question • Planning a data collection procedure • Collecting data • Summarizing data graphically and numerically • Performing appropriate inference procedures • Drawing conclusions • Presenting the entire project in a written report	Plan and implement a sample or experiment to collect data from a population of interest. Analyze the data to make conclusions about the population of interest.

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Unit X: Individualized Learning Project

ASSESSMENT EVIDENCE: Students will show their learning by:

- Creating a formal written report for the inferences and conclusions made during the final project.

KEY LEARNING EVENTS AND INSTRUCTION:

- Data Collection – students will perform their experiments or sample students to gather data for their projects.

SUGGESTED TIME ALLOTMENT	4 Weeks
SUPPLEMENTAL UNIT RESOURCES	Fathom Google Forms/Sheets Microsoft Office products

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APPENDIX A

Textbook:
The Practice of Statistics
Authors: Yates, Moore, Starnes
ISBN 978-1464108730
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Technology:
Software capable of statistical analysis in an educational environment such as Fathom
Graphing calculator

Web addresses:
College Board: http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2151.html
Rossman-Chance applet collection: http://www.rossmanchance.com/applets/index.html
Course and Exam Description: https://apcentral.collegeboard.org/pdf/ap-statistics-course-and-exam-description.pdf?course=ap-statistics