Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	**AP Statistics**

Grade Level(s):	11-12

Duration:	*Full Year:*	**X**	*Semester:*		*Marking Period:*	
Course Description:	The purpose of the Advanced Placement course in statistics is to introduce students to the major concepts and tools used to collect and analyze data. Subsequently, to draw conclusions from the data. Students will describe patterns and departures from patterns in data. Students will learn how to plan and conduct a study. Students will use probability and simulation to explore random phenomena, and students will use inference to test hypotheses and estimate population parameters. Due to the rigorous nature of the content, it is strongly recommended that a student have an 85 or better average in three years of honors mathematics courses or a 90 average or better in three years of college preparatory mathematics courses before taking the class.					
Grading Procedures:	Each semester will be a composite of quiz scores, test scores, homework, and participation reflecting a student's mastery of the areas outlined above. The student can pass the course with an overall average of 70%. The individual teacher will explain the grading system to the student.					
Primary Resources:	• Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019. • Sapling learning online tool. • APClassroom.collegeboard.org					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Michael Dempsey

Under the Direction of:	Dr. Carole English

Written: _____

Revised: _____

BOE Approval: _____

Unit Title: Exploring One-Variable data.

Unit Description:
Students will use technology to graph and analyze patterns in data. Students will use these graphic representations to examine and describe patterns and trends in data. Students will describe and measure the relative standing of individual values in a set of data and apply the meanings of these measurements in context.

Unit Duration: 4 weeks

Desired Results

Standard(s):
S-ID.A Summarize, represent, and interpret data on a single count or measurement variable

Indicators:
S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
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.

Understandings:
Students will understand that…
- It is important to use graphical summaries in addition to numeric summaries to better understand and summarize data
- It is important to summarize any set of one variable data by describing the center, shape, and spread.
- We can use percentiles, z-scores, and raw scores.
- The normal distribution is a very specific type of distribution that follows the empirical rule for the shape of the distribution.

Essential Questions:
1. How can we organize data?
2. What important features should be included when describing and summarizing data?
3. How do we compare relative positions of standing?
4. What are the main features of the Normal Distribution?

Assessment Evidence

Performance Tasks:
- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Statistical Applets

Other Evidence:
Kahn Academy Remediation
AP Classroom Progress Checks

Benchmarks:
Chapter 1 Test
Chapter 2 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 1.1 Analyzing Categorical Data

- Two-way tables
- Bar Graphs
- Circle Graphs

Section 1.2 Displaying Quantitative Data with Graphs

- Histograms
- Boxplots
- Normal Probability Plots

Section 1.3 Describing Quantitative Data with Numbers

- Measures of Center: Mean, Median, Mode
- Measures of Spread: Range, Standard Deviation, IQR

Section 2.1 Describing Location in a Distribution

- Measures of relative position: percentiles and z-scores

Section 2.2 Density Curves and Normal Distributions

- The empirical rule
- Normal distribution calculations

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
- Sapling learning online tool.
- APClassroom.collegeboard.org
- Graphing Calculators
- Kahn Academy Companion Course

Unit Modifications for Special Population Students	
Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
English Language Learners	• Accommodate with completed study guides to assist with preparation on tests • Allow students to give responses in a form (oral or written) that's easier for him/her • Be flexible with time frames, deadlines, or modify assessments • Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience • Establish a framework allowing ELL students to understand and assimilate new ideas and information • Focus on domain specific vocabulary and keywords • Give alternate or paper copies to accommodate electronic assignments. • Have another student share class notes with the ELL student. • Intentional scheduling/grouping with student/teacher of language if possible • Mark texts with a highlighter. • Take more time to complete a task, project, or test. • Use manipulatives, graphic organizer, and real objects when possible

	• Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems, **Life Literacies & Key Skills**

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity

Unit Title: 2 Exploring Two-Variable Quantitative Data

With the aid of technology, students will use scatterplots and linear regression to describe relationships between quantitative variables. Students will be able to interpret the meaning of the regression line slope, correlation coefficients, and coefficients of determination. Students will intelligently interpret the values of residuals and residual plots created from least squares regression lines.

Unit Duration: 2 Weeks

Desired Results

Standard(s):
S-ID.B Summarize, represent, and interpret data on two categorical and quantitative variables
S-ID.C Interpret linear models

Indicators:
S-ID.B.6a - Represent data on two quantitative variables on a scatter plot and describe how the variables are related.
S-ID.B.6b - Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
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.9 - Distinguish between correlation and causation.

Understandings:
Students will understand that…
- Scatterplots and correlation coefficients can tell us the strength, form, and association between two variables.
- The least squares regression line can be used to mathematically quantify the strength of a relationship between two variables.

Essential Questions:
What are the important features of a scatterplot?
What does the least squares regression line tell us about the relationship between two variables?

Assessment Evidence

Performance Tasks:
- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Statistical Applets

Other Evidence:
Kahn Academy Remediation
AP Classroom Progress Checks

Benchmarks:
Chapter 3 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 3.1Scatterplots and Correlation

- Distinguish between explanatory and response variables for quantitative data.
- Make a scatterplot to display the relationship between two quantitative variables.
- Describe the direction, form, and strength of a relationship displayed in a scatterplot and identify unusual features.
- Understand the basic properties of correlation, including how the correlation is influenced by unusual points.
- Distinguish correlation from causation

Section 3.2 Least-Squares Regression

- 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.
- Determine the equation of a least-squares regression line using technology or computer output.
- Construct and interpret residual plots to assess whether a regression model is appropriate.
- Interpret the standard deviation of the residuals and r 2 and use these values to assess how well a least-squares regression line models the relationship between two variables.
- Describe how the least-squares regression line, standard deviation of the residuals, and r 2 are influenced by unusual points.
- Find the slope and y intercept of the least-squares regression line from the means and standard deviation of residuals.

Section 3.3 Transforming to Achieve Linear

- Determine which of several models does a better job of describing the relationship between two quantitative variables

Resources:

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Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
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Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity

Unit Title: 3 Collecting Data

In this unit, students will examine appropriate sampling techniques, including random and non-random. Students will also consider various experiment techniques. An emphasis on the effects of bias will also be investigated. Students will then apply experiment techniques to solve real-world problems.

Unit Duration: 3 Weeks

Desired Results

Standard(s):

S-IC.A - Understand and evaluate random processes underlying statistical experiments

S-IC.B - Make inferences and justify conclusions from sample surveys, experiments, and observational studies

Indicators:

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.1 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Understandings:
Students will understand that…

- One of the major differences between an observational study and an experiment is an imposed treatment on subjects.
- Randomization is necessary for designing a valid experiment.
- If our study design contains bias, it will greatly affect our results.

Essential Questions:

1. What are the different ways to design an observational study?
2. What are the ways to design an experiment?
3. If our study design contains bias, it will greatly affect our results.

Assessment Evidence

Performance Tasks:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Statistical Applets

Other Evidence:
Kahn Academy Remediation
AP Classroom Progress Checks

Benchmarks:
Chapter 4 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 4.1 Sampling and Surveys

- Identify the differences between observational studies and experiments
- Identify types of sampling methods (stratified, simple random, cluster, systematic)

Section 4.2 Experiments

- Carefully design and experiment or observational study
- Explain the purpose of a block design experiment and design one
- Use randomization in an experiment

Section 4.3 Using Studies Wisely

- Correctly identify types and sources of bias and offer solutions to reduce the bias

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
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Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

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- Communication
- Critical thinking
- Creativity

Unit Title: 4 Probability, Random Variables, and Probability Distributions

Unit Description:
Students will describe sample spaces and use technology and other techniques to estimate probability and simulate random phenomena. Students will use Venn diagrams and two-way tables to calculate conditional probabilities.

Unit Duration: 4 Weeks

Desired Results

Standard(s):

S-IC.A - Understand and evaluate random processes underlying statistical experiments

S-CP.A - Understand independence and conditional probability and use them to interpret data

S-CP.B - Use the rules of probability to compute probabilities of compound events in a uniform probability model

S-MD.A - Calculate expected values and use them to solve problems

S-MD.B - Use probability to evaluate outcomes of decisions

Indicators:

S-IC.A.2 - Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

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 *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. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*

S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

S-CP.B6 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.B67Apply 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.B8 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-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 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. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

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. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

S-MD.B.5 - (Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

S-MD.B.5a Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*

S-MD.B.5b Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

S-MD.B.6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

S-MD.B.7 Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Understandings:	**Essential Questions:**
Students will understand that… • The probability of an event is the total possible favorable outcomes divided by total possible outcomes. • If two events are independent, then the probability of both events occurring is the product of their probabilities. • If the probability of an event occurring changes when another event occurs, then the two events are not independent. • Discrete random variables take on whole number values while continuous random variables take on decimal values. • Both parts of a linear transformation will affect the center of a variable's distribution, but only multiplication/division will affect the spread.	1. What is meant by the probability of an event? **2.** How do we use multiplication and addition to calculate the probability of compound events? **3.** What is meant by conditional probability? **4.** What is the difference between a discrete and a continuous random variable? **5.** What happens to the center shape and spread of a random variable when the variable is linearly transformed? **6.** What is the difference between a binomial and a geometric random variable?

• The difference between a geometric and binomial random variable is that the geometric random variable has no fixed number of trials.	

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Teacher guided examples • Interactive practice • Class Discussions • Cooperative projects • Statistical Applets	Kahn Academy Remediation AP Classroom Progress Checks

Benchmarks:
Chapter 5 Test
Chapter 6 Test

Learning Plan

Learning Activities:
- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 5.1 Randomness, Probability, and Simulation
- Compute the probability of simple and joint events.

Section 5.2 Probability Rules
- Use a two-way table to compute probabilities
- Use a Venn Diagram to compute probabilities

Section 5.3 Conditional Probability and Independence
- Determine if two events are independent
- Determine if two events are mutually exclusive

Section 6.1 Discrete and Continuous Random Variables
- Identify discrete and continuous random variables
- Find the center, shape, and spread for discrete and continuous random variables

Section 6.2 Transforming and Combining Random Variables
- Describe the effects of variable transformation on center, shape, and spread

Section 6.3 Binomial and Geometric Random Variables
- Find the center, shape, and spread for binomial and geometric random variables

Resources:
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Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
English Language Learners	• Accommodate with completed study guides to assist with preparation on tests • Allow students to give responses in a form (oral or written) that's easier for him/her • Be flexible with time frames, deadlines, or modify assessments • Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience • Establish a framework allowing ELL students to understand and assimilate new ideas and information • Focus on domain specific vocabulary and keywords • Give alternate or paper copies to accommodate electronic assignments. • Have another student share class notes with the ELL student. • Intentional scheduling/grouping with student/teacher of language if possible • Mark texts with a highlighter. • Take more time to complete a task, project, or test. • Use manipulatives, graphic organizer, and real objects when possible

	• Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems, **Life Literacies & Key Skills**

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity

Unit Title: 5 Sampling Distributions

Unit Description:
This unit applies probabilistic reasoning to sampling, introducing students to sampling distributions of statistics they will use when performing inference in Units 6 and 7. Students should understand that sample statistics can be used to estimate corresponding population parameters and that measures of center (mean) and variability (standard deviation) for these sampling distributions can be determined directly from the population parameters when certain sampling criteria are met. For large enough samples from any population, these sampling distributions can be approximated by a normal distribution. Simulating sampling distributions helps students to understand how the values of statistics vary in repeated random sampling from populations with known parameters

Unit Duration:3 Weeks

Desired Results

Standard(s):

S-IC.A - Understand and evaluate random processes underlying statistical experiments

Indicators:

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. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Understandings:
Students will understand that…

- The sampling distribution is the distribution of summarized means or proportions, centered about the population parameter with a smaller spread that is inversely proportional to the sample size.
- The central limit theorem allows us to apply the properties of a normal distribution to a sampling distribution if certain conditions are satisfied.

Essential Questions:
1.What is the central limit theorem?
2. How do we find the center, shape, and spread of a sampling distribution?

Assessment Evidence

Performance Tasks:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Statistical Applets

Other Evidence:
Kahn Academy Remediation
AP Classroom Progress Checks

Benchmarks:
Chapter 1-7 Test (Cumulative)

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 7.1 What is a sampling Distribution

- Describe the differences between a sampling distribution and a sample for a random variable.
- Describe the relationship between a sample, and a sampling distribution of a random variable.

Section 7.2 Sample Proportions

- Find the center, shape, and spread for various sampling distributions of proportions.
- Use the characteristics of a sampling distribution of proportions to compute probabilities.

Section 7.3 Sample Means

- Find the center, shape, and spread for sampling distributions of means
- Use the characteristics of a sampling distribution of means to compute probabilities.
-

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
- Sapling learning online tool.
- APClassroom.collegeboard.org
- Graphing Calculators
- Kahn Academy Companion Course

Unit Modifications for Special Population Students	
Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
English Language Learners	• Accommodate with completed study guides to assist with preparation on tests • Allow students to give responses in a form (oral or written) that's easier for him/her • Be flexible with time frames, deadlines, or modify assessments • Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience • Establish a framework allowing ELL students to understand and assimilate new ideas and information • Focus on domain specific vocabulary and keywords • Give alternate or paper copies to accommodate electronic assignments. • Have another student share class notes with the ELL student. • Intentional scheduling/grouping with student/teacher of language if possible • Mark texts with a highlighter. • Take more time to complete a task, project, or test. • Use manipulatives, graphic organizer, and real objects when possible

	• Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems, **Life Literacies & Key Skills**

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

Integration of 21st Century Skills
Indicators: From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include: Collaboration Communication Critical thinking Creativity

Unit Title: 6 Inference for Categorical Data: Proportions

Unit Description:
This unit introduces statistical inference, which will continue through the end of the course. Students will analyze categorical data to make inferences about binomial population proportions. Provided conditions are met, students will use statistical inference to construct and interpret confidence intervals to estimate population proportions and perform significance tests to evaluate claims about population proportions. Students begin by learning inference procedures for one proportion and then examine inference methods for a difference between two proportions. They will also interpret the two types of errors that can be made in a significance test, their probabilities, and possible consequences in context.

Unit Duration: 4 Weeks

Desired Results

Standard(s):
S-IC.B - Make inferences and justify conclusions from sample surveys, experiments, and observational studies

Indicators:

S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

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.

Understandings:	**Essential Questions:**
Students will understand that… • The central limit theorem allows us to approximate how close a sample proportion should be to the population parameter. • The central limit theorem and probability can be used to make an intelligent statistical inference about a claimed value of a population proportion.	How do we test a claim about a proportion for a population? How do we construct a confidence interval for a sample proportion?

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Teacher guided examples • Interactive practice • Class Discussions • Cooperative projects • Statistical Applets	Kahn Academy Remediation AP Classroom Progress Checks

Benchmarks:
Chapter 8 Test
Chapter 9 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 8.1 Confidence Intervals the Basics

- Explain the meaning of confidence in context.

Section 8.2 Estimating a Population Proportion

- How to construct and interpret a confidence interval for a sample proportion.
- How to explain the meaning of confidence in context.

Section 8.3 Estimating a difference between proportions

- How to construct and interpret a confidence interval for the difference in proportions.
- How to explain the meaning of confidence in context.

Section 9.1 Significance Tests the Basics

- Determine appropriate null and alternate hypotheses
- Explain the difference between type 1 and type 2 errors

Section 9.2 Tests about a Population Proportion

- Determine the appropriate test to use to test a hypothesis
- Carry out various hypothesis tests and state conclusions in context

Section 9.3 Tests about a Difference in Proportions

- Determine the appropriate test to use to test a hypothesis
- Carry out various hypothesis tests and state conclusions in context

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
- Sapling learning online tool.
- APClassroom.collegeboard.org
- Graphing Calculators
- Kahn Academy Companion Course

Unit Title: 7 Inference for Categorical Data: Means

Unit Description:
This unit introduces statistical inference, which will continue through the end of the course. Students will analyze quantitative data to make inferences about population means. Provided conditions are met, students will use statistical inference to construct and interpret confidence intervals to estimate population means and perform significance tests to evaluate claims about population means. Students begin by learning inference procedures for one proportion and then examine inference methods for a difference between two means. They will also interpret the two types of errors that can be made in a significance test, their probabilities, and possible consequences in context.

Unit Duration: 4 Weeks

Desired Results

Standard(s):
S-IC.B - Make inferences and justify conclusions from sample surveys, experiments, and observational studies

Indicators:

S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

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.

Understandings:	**Essential Questions:**
Students will understand that… • The central limit theorem allows us to approximate how close a sample mean should be to the population parameter. • The central limit theorem and probability can be used to make an intelligent statistical inference about a claimed value of a population mean.	How do we test a claim about a mean for a population? How do we construct a confidence interval for a sample mean?

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Teacher guided examples • Interactive practice • Class Discussions • Cooperative projects • Statistical Applets	Kahn Academy Remediation AP Classroom Progress Checks

Benchmarks:
Chapter 10 Test
Chapter 11 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 10.1 Estimating a Population mean

- Calculate critical values for the t-distribution
- Use the t-distribution to compute confidence intervals for means
- Interpret confidence intervals for means in context

Section 10.2 Estimating a Difference between means

- Calculate critical values for the t-distribution for the difference between two means
- Use the t-distribution to compute confidence intervals for the difference between means
- Interpret confidence intervals for differences in means in context

Section 11.1 Tests about a population mean

- Calculate critical values for the t-distribution
- Use the t-distribution to complete a hypothesis for a population mean
- Interpret results of hypothesis tests for means in context

Section 11.2 Tests about a difference in population means

- Calculate critical values for the t-distribution for the difference between two means
- Use the t-distribution to complete a hypothesis test for the difference between means
- Interpret results of hypothesis tests for the difference in means in context

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
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Unit Modifications for Special Population Students	
Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
English Language Learners	• Accommodate with completed study guides to assist with preparation on tests • Allow students to give responses in a form (oral or written) that's easier for him/her • Be flexible with time frames, deadlines, or modify assessments • Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience • Establish a framework allowing ELL students to understand and assimilate new ideas and information • Focus on domain specific vocabulary and keywords • Give alternate or paper copies to accommodate electronic assignments. • Have another student share class notes with the ELL student. • Intentional scheduling/grouping with student/teacher of language if possible • Mark texts with a highlighter. • Take more time to complete a task, project, or test.

	• Use manipulatives, graphic organizer, and real objects when possible • Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems,

Life Literacies & Key Skills
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

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Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity

Unit Title: 8 Inference for Categorical Data: Chi-Square

Unit Description:
Unit 8 introduces chi-square tests, which can be used when there are two or more categories. Students need to understand how to select from the following tests: the chi-square test for goodness of fit (for a distribution of proportions of one categorical variable in a population), the chi-square test for independence (for associations between categorical variables within a single population), or the chi-square test for homogeneity (for comparing distributions of a categorical variable across populations or treatments). To integrate conceptual understanding, teachers can make connections between frequency tables, conditional probability, and calculating expected counts. The chi-square statistic is introduced to measure the distance between observed and expected counts relative to expected counts.

Unit Duration: 3 Weeks

Desired Results

Standard(s):
S-IC.B - Make inferences and justify conclusions from sample surveys, experiments, and observational studies

Indicators:

S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

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.

Understandings:
Students will understand that…

- The chi-square distribution can be used to determine if there is a significant difference between the distributions of categorical data.
- The chi-square distribution can be used to determine if two categorical variables are related.

Essential Questions:
How do we test a claim about differences between distributions of categorical variables?
How do determine if there is a significant relationship between categorical variables?

Assessment Evidence

Performance Tasks:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Statistical Applets

Other Evidence:
Kahn Academy Remediation
AP Classroom Progress Checks

Benchmarks:
Chapter 12 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 12.1 Chi-square test for Goodness of Fit

- Calculate critical values for the chi-square distribution
- Use the chi-square goodness of fit test to determine if categorical variables have different distributions.
- Interpret the results of the chi-square goodness of fit test in context.

Section 12.2 Inference for two-way tables

- Determine if the chi-square test of association or test for homogeneity is appropriate
- Use the chi-square test to see if two categorical variables are related or come from populations with the same distributions.
- Interpret the results of chi-square tests in context.

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
- Sapling learning online tool.
- APClassroom.collegeboard.org
- Graphing Calculators
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Unit Modifications for Special Population Students	
Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
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	• Use manipulatives, graphic organizer, and real objects when possible • Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems,

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Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity

Unit Title: 9 Inference for Quantitative Data: Slope

Unit Description:
Students may be surprised to learn that there is variability in slope. In their experience in previous courses, the slope of the line of best fit does not vary for a particular set of bivariate quantitative data. However, suppose that every student in a university physics course collects data on spring length for 10 different hanging masses and calculates the least-squares regression line for their sample data. The students' slopes would likely vary as part of an approximately normal sampling distribution centered at the (true) slope of the population regression line relating spring length to hanging mass. In this unit, students will learn how to construct confidence intervals for and perform significance tests about the slope of a population regression line when appropriate conditions are met.

Unit Duration: 2 Weeks

Desired Results

Standard(s):
S-IC.B - Make inferences and justify conclusions from sample surveys, experiments, and observational studies
S-ID.B Summarize, represent, and interpret data on two categorical and quantitative variables
S-ID.C Interpret linear models

Indicators:

S-IC.B.3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

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.

S-ID.B.6a - Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

S-ID.B.6b - Informally assess the fit of a function by plotting and analyzing residuals,

including with the use of technology.

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.9 - Distinguish between correlation and causation.

Understandings:	**Essential Questions:**
Students will understand that… • The t-distribution can be used to test a hypothesis about a population slope. • The t-distribution can be used to estimate a population slope.	How do we test a claim about the relationship between two quantitative variables? How do we construct a confidence interval for the slope of a Least Squares Regression Line?

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Teacher guided examples • Interactive practice • Class Discussions • Cooperative projects • Statistical Applets	Kahn Academy Remediation AP Classroom Progress Checks

Benchmarks:
Chapter 12 Test

Learning Plan

Learning Activities:

- Teacher guided examples
- Interactive practice
- Class Discussions
- Cooperative projects
- Formative.com Practice

Unit Content:

Section 12.3 Inference for slope

- Linear Regression T-test
- Linear Regression T-interval

Resources:

- Starnes, Daren. *UPDATED The Practice of Statistics 6e*. Available from: Macmillan, (6th Edition). Macmillan Higher Education, 2019.
- Sapling learning online tool.
- APClassroom.collegeboard.org
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- Kahn Academy Companion Course

Unit Modifications for Special Population Students	
Advanced Learners	• Invite students to explore different points of view on a topic of study and compare the two. • Assign a leadership role in classroom learning • Determine where student's interests lie and capitalize on their inquisitiveness. • Expose students to a selection and use of specialized resources
Struggling Learners	• Be flexible with time frames and deadlines • Create planned opportunities for interaction between individuals in the classroom: cooperative and collaborative learning, pair and share with peers • Group students • Intentional scheduling/grouping with student/teacher of alternative background • Provide support as at-risk students move through all levels of knowledge acquisition • Tap prior knowledge
English Language Learners	• Accommodate with completed study guides to assist with preparation on tests • Allow students to give responses in a form (oral or written) that's easier for him/her • Be flexible with time frames, deadlines, or modify assessments • Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience • Establish a framework allowing ELL students to understand and assimilate new ideas and information • Focus on domain specific vocabulary and keywords • Give alternate or paper copies to accommodate electronic assignments. • Have another student share class notes with the ELL student. • Intentional scheduling/grouping with student/teacher of language if possible • Mark texts with a highlighter. • Take more time to complete a task, project, or test.

	• Use manipulatives, graphic organizer, and real objects when possible • Use visual presentations/verbal materials (ex: word webs and visual organizers).
Special Needs Learners	• Accommodate with completed study guides to assist with preparation on tests. • Allow more time to complete task, project, or test • Allow students to give responses in a form (oral or written) that's easier for him • Be flexible with time frames, deadlines, or modify assessments • Give alternate or paper copies to replace electronic assignments • Have another student share class notes with the special needs learner. • Higher level reasoning and questioning would have less weight than other assignments. • Receive study skill instructions. • Work with fewer items per page or line and/or materials in a larger print.
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections
Indicators: **ELA** **RST.11-12.3**. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text **RST.11-12.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.11-12.4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **Computer Science and Design Thinking** **8.1.12.DA.6**: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. **Technology Education** **9.3.ST.1**: Use technology to acquire, manipulate, analyze, and report data. **9.3.ST-SM.2**: Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems,

Life Literacies & Key Skills
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

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Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include:

- Collaboration
- Communication
- Critical thinking
- Creativity