## Course Title: AP/ College Statistics

### Grade Levels: 11th or 12th

<table>
<thead>
<tr>
<th>Month</th>
<th>Unit/Theme (Unit organizing idea)</th>
<th>Content (understandings)</th>
<th>Skills (What students actually do)</th>
<th>Major Assessments (Tests, projects, etc.)</th>
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</thead>
<tbody>
<tr>
<td>September</td>
<td>What is Statistics Exploring Data</td>
<td>Data Analysis Analyzing Categorical Data Displaying Quantitative Data with Graphs Describing Quantitative Data with Numbers</td>
<td>• Identify the individuals and variables in a set of data. • Classify variables as categorical or quantitative. • Display categorical data with a bar graph. Decide if it would be appropriate to make a pie chart. • Identify what makes some graphs of categorical data deceptive. • Calculate and display the marginal distribution of a categorical variable from a two-way table. • Calculate and display the conditional distribution of a categorical variable for a particular value of the other categorical variable in a two-way table. • Describe the association between two categorical variables by comparing appropriate conditional distributions. • Make and interpret dotplots and stemplots of quantitative data. • Describe the overall pattern (shape, center, and spread) of a distribution and identify any major departures from the pattern (outliers). • Identify the shape of a distribution from a graph as roughly symmetric or skewed. • Compare distributions of quantitative data using dotplots or stemplots. • Make and interpret histograms of quantitative data. • Compare distributions of quantitative data using histograms. • Calculate measures of center (mean, median). • Calculate and interpret measures of spread (range, IQR). • Choose the most appropriate measure of center and spread in a given setting. • Identify outliers using the 1.5×IQR rule. • Make and interpret boxplots of quantitative data. • Calculate and interpret measures of spread (standard deviation). • Choose the most appropriate measure of center and spread in a given setting. • Use appropriate graphs and numerical summaries to compare distributions of quantitative variables.</td>
<td>Problem of Day – Do Now Teacher Prepared Quiz Teacher Prepared Test Homework Board Presentation Case Closed FRAPPY!</td>
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<td>• Find and interpret the percentile of an individual value within a distribution of data.</td>
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<td>• Estimate percentiles and individual values using a cumulative relative frequency graph.</td>
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<td>• Find and interpret the standardized score (z-score) of an individual value within a distribution of data.</td>
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<td>• Describe the effect of adding, subtracting, multiplying by, or dividing by a constant on the shape, center, and spread of a distribution of data.</td>
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<td>• Estimate the relative locations of the median and mean on a density curve.</td>
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<td>• Use the 68–95–99.7 rule to estimate areas (proportions of values) in a Normal distribution.</td>
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<td>• Use Table A or technology to find (i) the proportion of z-values in a specified interval, or (ii) a z-score from a percentile in the standard Normal distribution.</td>
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<td>• Use Table A or technology to find (i) the proportion of values in a specified interval, or (ii) the value that corresponds to a given percentile in any Normal distribution.</td>
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<td>• Determine if a distribution of data is approximately Normal from graphical and numerical evidence.</td>
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<td>October</td>
<td>Describing Relationships</td>
<td>Scatterplots and Correlation Least-Squares Regression</td>
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<td>• Identify explanatory and response variables in situations where one variable helps to explain or influences the other. • 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 recognize outliers in a scatterplot. • Interpret the correlation. • Understand the basic properties of correlation, including how the correlation is influenced by outliers. • Use technology to calculate correlation. • Explain why association does not imply causation. • Interpret the slope and y intercept of a least-squares regression line. • Use the least-squares regression line to predict y for a given x. Explain the dangers of extrapolation. • Calculate and interpret residuals. • Explain the concept of least squares. • Determine the equation of a least-squares regression line using technology. • Construct and interpret residual plots to assess if a linear model is appropriate. • Interpret the standard deviation of the residuals and use these values to assess how well the least-squares regression line models the relationship between two variables. • Determine the equation of a least-squares regression line using computer output. • Describe how the slope, y intercept, standard deviation of the residuals, and are influenced by outliers. • Find the slope and y intercept of the least-squares regression line from the means and standard deviations of x and y and their correlation.</td>
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<td>• Identify the population and sample in a statistical study. • Identify voluntary response samples and convenience samples. Explain how these sampling methods can lead to bias. • Describe how to obtain a random sample using slips of paper, technology, or a table of random digits. • Distinguish a simple random sample from a stratified random sample or cluster sample. Give the advantages and disadvantages of each sampling method. • Explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias. • Distinguish between an observational study and an experiment. • Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions. • Identify the experimental units, explanatory and response variables, and treatments. • Explain the purpose of comparison, random assignment, control, and replication in an experiment. • Describe a completely randomized design for an experiment, including how to randomly assign treatments using slips of paper, technology, or a table of random digits.</td>
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<td>Novembe r</td>
<td>Probability: What are the Chances</td>
<td>Randomness, Probability, and Simulation Probability Rules Conditional Probability and Independence</td>
<td>• Interpret probability as a long-run relative frequency. • Use simulation to model chance behavior. • Determine a probability model for a chance process. • Use basic probability rules, including the complement rule and the addition rule for mutually exclusive events. • Use a two-way table or Venn diagram to model a chance process and calculate probabilities involving two events. • Use the general addition rule to calculate probabilities. • Calculate and interpret conditional probabilities. • Use the general multiplication rule to calculate probabilities. • Use tree diagrams to model a chance process and calculate probabilities involving two or more events. • Determine whether two events are independent. • When appropriate, use the multiplication rule for independent events to compute probabilities.</td>
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<td>December</td>
<td>Random Variables</td>
<td>Discrete and Continuous Random Variables Transforming and Combining Random Variables Binomial and Geometric Random Variables</td>
<td>• Compute probabilities using the probability distribution of a discrete random variable. • Calculate and interpret the mean (expected value) of a discrete random variable. • Calculate and interpret the standard deviation of a discrete random variable. • Compute probabilities using the probability distribution of a continuous random variable. • Describe the effects of transforming a random variable by adding or subtracting a constant and multiplying or dividing by a constant. • Find the mean and standard deviation of the sum or difference of independent random variables. • Find probabilities involving the sum or difference of independent Normal random variables. • Determine whether the conditions for using a binomial random variable are met. • Compute and interpret probabilities involving binomial distributions. • Calculate the mean and standard deviation of a binomial</td>
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| January | Sampling Distributions | What is a sampling distribution  
Sample Proportions  
Sample Means | • Find the mean and standard deviation of the sampling distribution of a sample proportion $\hat{p}$. Check the 10% condition before calculating $\hat{p}$.  
• Determine if the sampling distribution of $\hat{p}$ is approximately Normal.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$.  
• Find the mean and standard deviation of the sampling distribution of a sample mean $\bar{x}$. Check the 10% condition before calculating $\bar{x}$.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\bar{x}$.  
• Explain how the shape of the sampling distribution of $\hat{p}$ is affected by the shape of the population distribution and the sample size.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$. | Problem of Day – Do Now  
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| random variable. Interpret these values in context.  
• Find probabilities involving geometric random variables.  
• Find the mean and standard deviation of the sampling distribution of a sample proportion $\hat{p}$. Check the 10% condition before calculating $\hat{p}$.  
• Determine if the sampling distribution of $\hat{p}$ is approximately Normal.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$.  
• Find the mean and standard deviation of the sampling distribution of a sample mean $\bar{x}$. Check the 10% condition before calculating $\bar{x}$.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\bar{x}$.  
• Explain how the shape of the sampling distribution of $\hat{p}$ is affected by the shape of the population distribution and the sample size.  
• If appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$. | |

| • Distinguish between a parameter and a statistic.  
• Distinguish among the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic.  
• Use the sampling distribution of a statistic to evaluate a claim about a parameter.  
• Determine whether or not a statistic is an unbiased estimator of a population parameter.  
• Describe the relationship between sample size and the variability of a statistic. |  |
<p>| February | Estimating with Confidence | Confidence Intervals: The Basics Estimating a Population Proportion Estimating a Population Mean | • Interpret a confidence interval in context. • Interpret a confidence level in context. • Determine the point estimate and margin of error from a confidence interval. • Describe how the sample size and confidence level affect the length of a confidence interval. • Explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval. • State and check the Random, 10%, and Large Counts conditions for constructing a confidence interval for a population proportion. • Determine critical values for calculating a C% confidence interval for a population proportion using a table or technology. • Construct and interpret a confidence interval for a population proportion. • Determine the sample size required to obtain a C% confidence interval for a population proportion with a specified margin of error. • Explain how the t distributions are different from the standard Normal distribution and why it is necessary to use a t distribution when calculating a confidence interval for a population mean. • Determine critical values for calculating a C% confidence interval for a population mean using a table or technology. • State and check the Random, 10%, and Normal/Large Sample conditions for constructing a confidence interval for a population mean. • Construct and interpret a confidence interval for a population mean. • Determine the sample size required to obtain a C% confidence interval for a population mean with a specified margin of error. |
| February | Testing a Claim | Significance Tests: The Basics Tests about a Population Proportion Tests about a Population Mean | • State the null and alternative hypotheses for a significance test about a population parameter. • Interpret a P-value in context. • Determine if the results of a study are statistically significant and draw an appropriate conclusion using a significance level. • Interpret a Type I and a Type II error in context, and give a consequence of each. • State and check the Random, 10%, and Large Counts conditions for performing a significance test about a population proportion. • Perform a significance test about a population proportion. |</p>
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<tr>
<th>Month</th>
<th>Topics</th>
<th>Tests and Comparisons</th>
<th>Supplemental Resources</th>
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| March | Comparing Two Populations or Groups                                    | • Use a confidence interval to draw a conclusion for a two-sided test about a population parameter.
  |                                                          | • Interpret the power of a test and describe what factors affect the power of a test.
  |                                                          | • Describe the relationship among the probability of a Type I error (significance level), the probability of a Type II error, and the power of a test.
  |                                                          | • State and check the Random, 10%, and Normal/Large Sample conditions for performing a significance test about a population mean.
  |                                                          | • Perform a significance test about a population mean.
  |                                                          | • Use a confidence interval to draw a conclusion for a two-sided test about a population parameter.
  |                                                          | • Perform a significance test about a mean difference using paired data.               | Problem of Day – Do Now Teacher Prepared Quiz Teacher Prepared Test Homework Board Presentation Case Closed FRAPPY!|
| April | Inference for Distribution of Categorical Data                         | • State appropriate hypotheses and compute expected counts for a chi-square test for goodness of fit.
  |                                                          | • Calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test for goodness of fit.
  |                                                          | • Perform a chi-square test for goodness of fit.
  |                                                          | • Conduct a follow-up analysis when the results of a chi-square test are statistically significant.
  |                                                          | • Compare conditional distributions for data in a two-way table.
  |                                                          | • State appropriate hypotheses and compute expected counts for a chi-square test based on data in a two-way table.
  |                                                          | • Calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test based on data in a two-way table.
  |                                                          | • Perform a chi-square test for homogeneity.
  |                                                          | • Perform a chi-square test for independence.
  |                                                          | • Choose the appropriate chi-square test.                                              | Problem of Day – Do Now Teacher Prepared Quiz Teacher Prepared Test Homework Board Presentation Case Closed FRAPPY!|
| April | More about Regression | Inference for Linear Regression  
Transforming to Achieve Linearity | • Check the conditions for performing inference about the slope of the population (true) regression line.  
• Interpret the values of a, b, s, , and in context, and determine these values from computer output.  
• Construct and interpret a confidence interval for the slope of the population (true) regression line.  
• Perform a significance test about the slope of the population (true) regression line. | Problem of Day – Do Now  
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| May | Review for AP Exam | Review for AP Exam | • Use transformations involving powers and roots to find a power model that describes the relationship between two variables, and use the model to make predictions.  
• Use transformations involving logarithms to find a power model or an exponential model that describes the relationship between two variables, and use the model to make predictions.  
• Determine which of several transformations does a better job of producing a linear relationship. | AP EXAM REVIEW  
• Practice AP Free Response Questions  
• Choosing the Correct Inference Procedure  
• Flash cards  
• Mock Grading Sessions  
• Rubric development by student teams  
• Practice Multiple Choice Questions  
Final Exam  
Final Project Progress Checkpoints |
| June | Final Project | Reinforces all concepts learned throughout the year. | Final project  
Final project presentation | Final Project Progress Checkpoints  
Final Project Paper  
Final Project Presentation | Reviewed Fall 2020 |