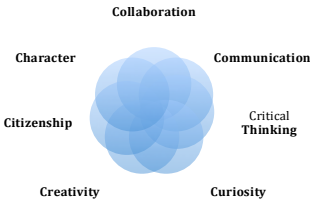
Content Area: Mathematics	Course: AP Statistics	Grade Level: 11-12
	R14 The Seven Cs of Learning 	

Unit Titles	Length of Unit
• *Descriptive Statistics*	5-6 weeks
• *Regression*	4-5 weeks
• *Collecting Data, Probability and Simulation*	5-6 weeks
• *Discrete and continuous random variables*	4-5 weeks
• *Central Limit Theorem*	3-4 weeks
• *Inference for Proportions*	5-6 weeks
• *Inference for Means*	2-3 weeks
• *Chi-squared*	1 week
• Review for AP test/Post AP test	5-6 weeks

Strands	Course Level Expectations
High School: Interpreting Categorical and Quantitative Data (ID)	• Summarize, represent, and interpret data on a single count or measurement variable. • 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. • Fit a function to the data; 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, quadratic, and exponential models. • Distinguish between correlation and causation.
High School: Making Inferences and Justifying Conclusions (IC)	• Understand and evaluate random processes underlying statistical experiments. • Make inferences and justify conclusions from sample surveys, experiments, and observational studies. • Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. • Evaluate reports based on data.

Strands	Course Level Expectations
High School: Conditional Probability and the Rules of Probability (CP)	• Understand independence and conditional probability and use them to interpret data. • 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"). • Use permutations and combinations to compute probabilities of compound events and solve problems. • Use the rules of probability to compute probabilities of compound events.
High School: Using Probability to Make Decisions (MD)	• Calculate expected values and use them to solve problems. • Use probability to evaluate outcomes of decisions

Unit Title	Descriptive Statistics	**Length of Unit**	5-6 weeks

Inquiry Questions **(Engaging & Debatable)**	• When are descriptive statistics appropriate and when must we use inferential statistics? • What are the best statistics to use to describe a distribution? • What are the important features to discuss when describing a graphical display of data? • What does it mean if data is normally distributed?
Standards	**Interpreting Categorical & Quantitative Data:** HSS.ID.A.1, HSS.ID.A.2, HSS.ID.A.3, HSS.ID.A.4
Unit Strands & Concepts	• Vocabulary of Statistics • Describing Graphs (GSOCS) • Describing center and spread with statistics • Normal distribution
Key Vocabulary	Descriptive statistics, inferential statistics, population, sample, categorical variable, quantitative variable, discrete random variable, continuous random variable, GSOCS, mean, median, mode, central tendency, interquartile range, outlier, boxplot, standard deviation, empirical rule, normal distribution, z-score

Unit Title	Descriptive Statistics	**Length of Unit**	5-6 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The difference between descriptive and inferential statistics, between population and sample, between categorical and quantitative variables, between discrete and continuous random variables • How to completely describe a graph • How to numerically describe a distribution • Normally distributed data is completely determined by the mean and standard deviation • Using the standard normal table allows calculation of percentiles and values for normally distributed data	• Use GSOCS to describe a graph • Use measures of center and spread to describe a distribution and to compare distributions • Use z-scores to compare values from different distributions • Calculate probabilities for normally distributed data • Calculate a value given a percentile for normally distributed data

Assessments:	• Quizzes, McDonald's problem • Unit 1 project and Unit 1 test
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Regression	**Length of Unit**	4-5 weeks

Inquiry Questions (Engaging & Debatable)	• Why is the least squares regression line the "best fit" line? • How do we evaluate different transformation models to determine the best fit for the data? • When is it appropriate to extrapolate? • How are correlation and causation related?
Standards	**Interpreting Categorical & Quantitative Data:** HSS.ID.B.6, HSS.ID.B.6.A, HSS.ID.B.6.B, HSS.ID.B.6.C, HSS.ID.C.7, HSS.ID.C.8
Unit Strands & Concepts	• Sketching and describing scatterplots • Measuring strength with correlation coefficient • Correlation vs. causation • Least squares regression line from formulas, calculator, computer output • Residual plots • Transforming data to achieve linearity
Key Vocabulary	Explanatory variable, response variable, FUDS, correlation coefficient, causation, least squares regression line, coefficient of determination, residual, residual plot, transformation on data, extrapolation

Unit Title	Regression	**Length of Unit**	4-5 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• How to completely describe a scatterplot • Correlation coefficient measures strength of linear relationship only • Correlation does not imply causation • The least squares regression line minimizes the sum of the squares of the residuals • A residual plot helps to determine if a linear fit is the best model • If a linear fit is not the best model, data must be transformed to a linear model	• Sketch a scatterplot and describing using FUDS • Measure strength using correlation coefficient • Determine equation of least squares regression line using formulas, calculator, computer output • Interpret a residual plot • Transform data using quadratic, exponential, and power function models

Assessments:	• Formative Assessments • Performance Project (Find data, make linear model, answer questions about linear model) • Summative Assessment
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Collecting Data, Probability & Simulation	Length of Unit	5-6 weeks

Inquiry Questions (Engaging & Debatable)	● Why is the data collection process vital to the success of the data analysis process? ● When is a sample appropriate and when is an experiment appropriate? ● How can simulation be used to estimate probabilities that are different to calculate directly?
Standards	**Making Inferences and Justifying Conclusions:** IC.A.1, IC.A.2, IC.B.3, IC.B.4, IC.B.5, IC.B.6 **Conditional Probability:** CP.A.1, CP.A.2, CP.A.3, CP.A.4, CP.A.5, CP.B.6, CP.B.7, CP.B.8
Unit Strands & Concepts	• Parameter vs. statistic • Types of samples • Bias in sampling • Experiment vs. observational study • Designing experiments • Basic probability • Conditional probability • Probability with unions and intersections • Independence • Using simulation to estimate probabilities
Key Vocabulary	Parameter, statistic, Simple Random Sample (SRS), stratified sample, cluster sample, convenience sample, voluntary response sample, census, systematic sample, bias, observational study, experiment, experimental units, factors, levels, treatments, blocking, matched pairs, probability, conditional probability, union, intersection, independence, simulation

Unit Title	Collecting Data, Probability & Simulation	**Length of Unit**	5-6 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• If samples are unbiased, sample statistics can be used to estimate population parameters • Well designed experiments are used to establish causation • Often probabilities can be calculated directly; when they cannot, simulation can be used to estimate probabilities	• Identify the type of sample used and decide if it is appropriate • Identify bias in sampling • Distinguish between an experiment and an observational study • Design an experiment • Calculate basic probabilities, conditional probabilities, probabilities of unions and intersections • Use probabilities to determine if events are independent • Use simulation to estimate probabilities

Assessments:	• Formative Assessments: (Sampling, Critically analyzing articles, experiments) • Performance Assessments (Design experiment, Simulation problem); • Summative Assessment
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Discrete and Continuous Random Variables	Length of Unit	4-5 weeks

Inquiry Questions (Engaging & Debatable)	• Why can a discrete probability distribution be represented with a table, but a continuous distribution cannot? • How are the mean and standard deviation affected by transformations on random variables? • How are a binomial and geometric random variables similar and different?
Standards	**Using Probability to Make Decisions:** MD.A.1, MD.A.2, MD.A.3 MD.A.4, MD.B.5, MD.B.5.A, MD.B.5.B, MD.B.6, MD.B.7
Unit Strands & Concepts	• Discrete probability distribution • Mean and standard deviation of discrete probability distribution • Continuous random variable, including uniform distribution • Linear function of random variable and impact on mean and standard deviation • Linear combination of random variable and impact on mean and standard deviation • Binomial Distribution • Geometric Distribution
Key Vocabulary	Discrete probability distribution, uniform distribution, linear function of random variable, linear combination of random variable, binomial random variable, geometric random variable

Unit Title	Discrete and Continuous Random Variables	**Length of Unit**	4-5 weeks

Critical Content: My students will Know…	**Key Skills: My students will be able to (Do)…**
• A discrete random variable can be expressed as a probability distribution because all possible values can be listed; Continuous random variables are expressed as graphs • Adding a constant to all values impacts the mean but not the standard deviation of a random variable; multiplying by a constant impacts both the mean and the standard deviation • When random variables are combined, we work with the variances rather than the standard deviations • A geometric distribution is a waiting time distribution; a binomial distribution has a set number of trials	• Write a discrete probability distribution based on a situation • Calculate probabilities and mean and standard deviation from discrete probability distribution • Use a graph or the normal curve to describe a continuous random variable • Calculate mean and standard deviation of linear function of random variable • Calculate mean and standard deviation of linear combination of random variables • Distinguish between binomial and geometric random variables • Calculate binomial probabilities • Calculate probabilities for geometric r.v.

Assessments:	• Formative Assessments (discrete probability distribution, mean and standard deviation of discrete probability distribution, linear function and linear combination of r.v.) • Summative Assessment
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Central Limit Theorem	**Length of Unit**	3-4 weeks

Inquiry Questions **(Engaging & Debatable)**	● How is sample size related to the sampling distribution of sample means and proportions?
Standards	**Using Probability to Make Decisions:** MD.A.1, MD.A.2, MD.A.3 MD.A.4, MD.B.5, MD.B.5.A, MD.B.5.B, MD.B.6, MD.B.7
Unit Strands & Concepts	• Sampling distribution • Sample sizes needed for normal approximation • Mean and standard deviation of sampling distribution of sample means • Mean and standard deviation of sampling distribution of sample proportions
Key Vocabulary	Central limit theorem, sampling distribution of sample means, sampling distribution of sample proportions, mean of sampling distribution, standard deviation of sampling distribution, p-hat

Unit Title	Central Limit Theorem	**Length of Unit**	3-4 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
● As sample sizes increase, the distribution of the sample means or sample proportions becomes approximately normal ● If we calculate the mean and standard deviation of the sampling distribution of the sample mean or sample proportion, we can use the normal curve to calculate probabilities	● Determine the sample size necessary for the distribution of sample means or sample proportions to become approximately normally distributed ● Use the Central Limit Theorem to calculate probabilities involving the sampling distribution of sample means and sample proportions

Assessments:	• Formative Assessments
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Inference for Proportions	**Length of Unit**	5-6 weeks

Inquiry Questions (Engaging & Debatable)	• How can statistics help us make inferences about the population of interest? • Why is a confidence interval more meaningful than a point estimate? • Why is it important that certain conditions be met before making inferences? • How are sample size and level of confidence related to the margin of error? • How can a sample statistic be used to make a decision about a hypothesis? • How can tests be conducted to minimize error?
Standards	**Making Inferences and Justifying Conclusions:** IC.A.1, IC.A.2 **Using Probability to Make Decisions:** MD.B.6, MD.B.7
Unit Strands & Concepts	• Confidence intervals for proportions • Assumptions and conditions for inference • Sample size needed for desired margin of error • Significance tests (hypothesis tests) • Types of errors • Probability of errors and power of the test • Performing inference on the TI • Two proportion inference
Key Vocabulary	Confidence interval, margin of error, z*, conditions and assumptions, null hypothesis, alternative hypothesis, significance test (hypothesis test), reject null hypothesis, fail to reject null hypothesis, p-value, type 1 error, type 2 error, power of test, 1 proportion inference, 2 proportion inference

Unit Title	Inference for Proportions	**Length of Unit**	5-6 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• Confidence intervals are used to estimate a population parameter based on a sample statistic • To be more confident, a larger interval is needed • A larger sample size decreases the standard deviation which leads to a narrower interval • Hypothesis tests are used to test if a statistic is far enough away from the hypothesized value of the parameter to allow us to reject the null hypothesis • There are two types of errors we can make as the result of the test	• Construct a confidence interval for a proportion • Determine the sample size needed for a desired margin of error • Conduct a hypothesis test for a proportion • Identify the type 1 and type 2 error for a test • Construct a confidence interval for the difference between 2 proportions • Conduct a hypothesis test to test if there is a difference between two proportions

Assessments:	• Formative Assessments: (Confidence Intervals, hypothesis tests, errors) • Summative Assessment
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response problems

Unit Title	Inference for Means	**Length of Unit**	2-3 weeks

Inquiry Questions (Engaging & Debatable)	● How does the t-distribution differ from a z-distribution? ● How is a matched pairs test different from a 2-sample test?
Standards	**Making Inferences and Justifying Conclusions:** IC.A.1, IC.A.2 **Using Probability to Make Decisions:** MD.B.6, MD.B.7
Unit Strands & Concepts	Confidence interval for means Assumptions and conditions for inference Hypothesis test for means 2 sample t-interval 2 sample t-test Matched pairs test
Key Vocabulary	T-distribution, matched pairs test

Unit Title	Inference for Means	**Length of Unit**	2-3 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The t-distribution is used when we are working with means and don't know the population standard deviation • Two sample inference studies the difference between means; matched pairs studies the mean of the differences	• Construct a confidence interval to estimate a mean • Conduct a hypothesis test for a mean • Distinguish between 2 sample and matched pairs problems

Assessments:	• Formative Assessments: (Sample CI and hypothesis tests, mixed inference problems) • Summative Assessment (Distribution involving mean and proportions; construct CI and conduct hypothesis tests)
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response

Unit Title	Chi Squared Distribution	Length of Unit	1 week

Inquiry Questions (Engaging & Debatable)	• Why is it important to distinguish between the three types of Chi-squared tests? • How does the Chi squared test for independence differ from independence in probability?
Standards	**Interpreting Categorical & Quantitative Data:** ID.B.5 **Making Inferences and Justifying Conclusions:** IC.A.1, IC.A.2 **Using Probability to Make Decisions:** MD.B.6, MD.B.7
Unit Strands & Concepts	• Chi squared test • Goodness of fit test vs. homogeneity vs. independence
Key Vocabulary	Chi squared distribution, marginal distribution, goodness of fit, homogeneity, independence

Unit Title	Chi Squared Distribution	Length of Unit	1 week

Critical Content: My students will **Know**…	Key Skills: My students will be able to **(Do)**…
• A chi squared test of independence is a way of determining whether two categorical variables are associated with one another in the population • A chi squared test of homogeneity is an extension of the two proportion z-test • A goodness of fit test is an extension of the one-proportion z-test.	• Distinguish between goodness of fit, homogeneity, and independence • Perform a Chi-square test by hand and on the TI

Assessments:	• Formative Assessment: (Chi Squared Assessment)
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response

Unit Title	Review for AP Exam	Length of Unit	5-6 weeks

Inquiry Questions (Engaging & Debatable)	• How can the entire data collection process be put together to conduct a statistically significant study? • How can prove all you know?
Standards	See AP course materials
Unit Strands & Concepts	See AP course materials
Key Vocabulary	See AP course materials

Unit Title	Review for AP Exam	**Length of Unit**	5-6 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• How to be successful on the AP Statistics exam • How to start with a question and collect and analyze the data to answer it	• Demonstrate ability to relate all of the topics which we studied to a larger topic • Design and carry out a research project to answer a question of students' choosing

Assessments:	• Performance Task: Deal or no deal? • Final Project
Teacher Resources:	❖ R14 Implementation Guide ❖ Released AP Statistics free response