

AP Statistics Scope & Sequence

Days May Vary	Unit	Outcome(s)	Essential/Guiding Questions
6-8	Unit 1: Exploring Data	<ul style="list-style-type: none"> ● Classify variables as categorical or quantitative, so you can display the data using the appropriate type of graph. ● Interpret different types of graphs of categorical data, and identify what makes some graphs of data deceptive. ● Calculate and display the marginal and conditional distributions of a categorical variable from a two-way table to describe the association between two categorical variables. ● Make, interpret, and compare distributions of quantitative data using dotplots, stemplots, and histograms. ● Describe the overall pattern of a distribution and identify any major departures from the pattern using SOCS. 	<ul style="list-style-type: none"> ● How do you classify variables so you can display the data using the appropriate graph? ● What makes some graphs deceptive? ● Describe the association between two categorical variables? ● How do you interpret and compare distributions of quantitative data? ● How do you calculate and interpret measures of center and spread? ● How do boxplots allow you to compare and interpret distributions of quantitative data?

		<ul style="list-style-type: none"> ● Calculate and interpret measures of center and spread, and choose the most appropriate measure of center and spread in a given setting. ● Interpret, and compare distributions of quantitative data using boxplots. 	
6-8	Unit 2: Modeling Distributions of Data	<ul style="list-style-type: none"> ● Find, interpret, and estimate the percentile of an individual value within a distribution of data, using a cumulative relative frequency graph. ● Find and interpret the standardized score (z-score) of an individual value within a distribution of data. ● Describe the effect of adding, subtracting, multiplying by, or dividing by a constant on the shape, center, and spread of a distribution of data. ● Estimate the relative locations of the median and mean on a density curve, and use the 68–95–99.7 rule to estimate areas in a Normal distribution ● Find the proportion of values (z-values) in a specified interval, or the value that corresponds 	<ul style="list-style-type: none"> ● How do you interpret the percentile of an individual value and the standardized score of an individual value within a distribution of data? ● How do you estimate the relative locations of the median and the mean on a density curve? ● How do you find the proportion of values in a specified interval? ● How do you determine if a distribution of data is Normal from the graphical and numerical evidence?

		<p>to a given percentile in the Normal distribution.</p> <ul style="list-style-type: none"> ● Determine if a distribution of data is approximately Normal from graphical and numerical evidence. 	
6-8	Unit 3: Describing Relationships	<ul style="list-style-type: none"> ● Identify explanatory and response variables in situations where one variable helps to explain or influences the other. ● Make a scatter plot to display the relationship between two quantitative variables and describe the direction, form, and strength of the relationship displayed. ● Interpret the correlation, and understand the basic properties of correlation, including how it is influenced by outliers. ● Explain why association does not imply causation. ● Interpret the slope and y intercept of a least-squares regression line, then use it to predict y for a given x. Then, explain the dangers of extrapolation. ● Explain the concept of least 	<ul style="list-style-type: none"> ● How do you identify explanatory and response variables in various situations? ● How do you interpret the correlation and how it is influenced by outliers? ● How does association imply or not imply causation? ● How do you interpret the slope and the y-intercept of a least squares regressions line? ● How do you determine the equation of a least-squares regression line? ● How do you interpret the standard deviation of the residuals and r^2?

		<p>squares and determine the equation of a least-squares regression line using technology and computer output.</p> <ul style="list-style-type: none"> ● Calculate and interpret residuals, then construct and interpret residual plots to assess if a linear model is appropriate. ● Interpret the standard deviation of the residuals and r^2 and use these values to assess how well the least-squares regression line models the relationship between two variables. ● Describe how the slope, y intercept, standard deviation of the residuals, and r^2 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. 	
6-8	Unit 4: Designing Studies	<ul style="list-style-type: none"> ● Identify the population and sample in a statistical study, and describe how to obtain a 	<ul style="list-style-type: none"> ● Describe how to find a random sample? ● How can voluntary

		<p>random sample using slips of paper, technology, or a table of random digits.</p> <ul style="list-style-type: none">● Identify voluntary response samples and convenience samples. Explain how these sampling methods can lead to bias, and how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias.● Distinguish a simple random sample from a stratified random sample or cluster sample. Give the advantages and disadvantages of each sampling method.● Identify the experimental units, explanatory and response variables, and treatments, then 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, then describe the placebo effect and the purpose of blinding in an experiment.	<p>response samples and convenience samples lead to bias?</p> <ul style="list-style-type: none">● How do you identify experimental units, explanatory and response variables and treatments?● What is the purpose of blocking an experiment?● How do you evaluate whether a statistical study has been carried out in an ethical manner?
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6-8	Unit 5: Probability: What are the chances?	<ul style="list-style-type: none"> ● Interpret probability as a long-run relative frequency, and use simulation to model chance behavior. ● Determine a probability model for a chance process, and use the general addition rule to calculate probabilities. ● 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. ● Calculate and interpret conditional probabilities, and 	<ul style="list-style-type: none"> ● How do you determine the probability for a chance process? ● How do you model a chance process? ● How do you interpret conditional probabilities? ● How do you determine whether two events are independent?

		<p>use the general multiplication rule to calculate probabilities.</p> <ul style="list-style-type: none"> ● Use tree diagrams to model a chance process and calculate probabilities involving two or more events. ● Determine whether two events are independent, then use the multiplication rule for independent events to compute probabilities 	
6-8	Unit 6: Random Variables	<ul style="list-style-type: none"> ● Compute probabilities using the probability distribution of a discrete or continuous random variable. ● Calculate and interpret the mean and standard deviation of a discrete 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, standard deviation, and probabilities involving the sum or difference of independent random variables and Normal random variables. 	<ul style="list-style-type: none"> ● How do you compute probabilities using the probability distribution of a discrete or continuous random variable? ● How do you interpret the mean and standard deviation of a discrete random variable? ● How would you describe the effects of transforming a random variable by adding, subtracting, multiplying, or dividing by a constant? ● How do you determine whether the conditions for using a binomial random variable or a geometric

		<ul style="list-style-type: none"> ● Determine whether the conditions for using a binomial random variable are met, and then compute and interpret probabilities and calculate the mean and standard deviation of binomial distributions. ● Determine whether the conditions for using a geometric random variable are met, and then compute and interpret probabilities and calculate the mean of geometric distributions. 	<p>random variable are met?</p>
6-8	Unit 7: Sampling Distributions	<ul style="list-style-type: none"> ● Distinguish between a parameter and a statistic, and determine whether a statistic is an unbiased estimator of a population parameter. ● 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, and describe the relationship between sample size and the variability of a statistic. 	<ul style="list-style-type: none"> ● How do you distinguish between a parameter and a statistic? ● How do you determine whether a statistic is an unbiased estimator or a population parameter? ● How do you evaluate a claim about a parameter? ● What is the relationship between sample size and the variability of a statistic? ● How do you determine if a sampling of \hat{p} is approximately Normal? ● How is the shape of the

		<ul style="list-style-type: none"> ● Find the mean and standard deviation of the sampling distribution of a sample proportion \hat{p}, and check the 10% condition before calculating $\sigma_{\hat{p}}$. ● Determine if the sampling distribution of \hat{p} is approximately Normal, and then 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 $\sigma_{\bar{x}}$, and use a Normal distribution to calculate probabilities involving $\sigma_{\bar{x}}$. ● Explain how the shape of the sampling distribution of \bar{x} is affected by the shape of the population distribution and the sample size. 	<p>sampling distribution of \bar{x} affected by the shape of the population distribution and the sample size?</p>
6-8	Unit 8: Estimation with Confidence	<ul style="list-style-type: none"> ● Interpret a confidence interval and a confidence level in context. ● Determine the point estimate and margin of error from a 	<ul style="list-style-type: none"> ● How do you interpret a confidence interval? ● How do the sample size and confidence level affect the length of a confidence

		<p>confidence interval.</p> <ul style="list-style-type: none">● 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, and 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	<p>interval?</p> <ul style="list-style-type: none">● How do you determine critical values for calculating a C% confidence interval for a population proportion?● How are the t-distributions different from the Normal distribution?
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		<p>distribution when calculating a confidence interval for a population mean.</p> <ul style="list-style-type: none"> ● 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, and 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. 	
6-8	Unit 9: Testing a Claim	<ul style="list-style-type: none"> ● State the null and alternative hypotheses for a significance test about a population parameter, then interpret a P-value in context, and determine if the results of a study are statistically significant and draw an appropriate conclusion using a significance level. 	<ul style="list-style-type: none"> ● How do you determine if the results of a study are statistically significant? ● How do you interpret Type I and Types II errors in content? ● How do you use a confidence interval to draw a conclusion for a two-sided test about a

		<ul style="list-style-type: none">● 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, and then perform a significance test about a population proportion● 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, and 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, and perform a significance test about a population mean.● Use a confidence interval to	<ul style="list-style-type: none">● population parameter?● How would you interpret and describe the power of a test?
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		<p>draw a conclusion for a two-sided test about a population parameter.</p> <ul style="list-style-type: none"> ● Perform a significance test about a mean difference using paired data. 	
6-8	Unit 10: Comparing Two Populations or Groups	<ul style="list-style-type: none"> ● Describe the shape, center, and spread of the sampling distribution of $\hat{p}_1 - \hat{p}_2$, and determine whether the conditions are met for doing inference about $P_1 - P_2$. ● Construct and interpret a confidence interval and perform a significance test to compare two proportions. ● Describe the shape, center, and spread of the sampling distribution of $\bar{x}_1 - \bar{x}_2$, and determine whether the conditions are met for doing inference about $\mu_1 - \mu_2$. ● Construct and interpret a confidence interval and perform a significance test to compare two mean ● Determine when it is appropriate to use two-sample t procedures versus paired t procedures. 	<ul style="list-style-type: none"> ● How would you determine whether the conditions were met for doing inference about $P_1 - P_2$? ● What might you interpret when performing a significance test to compare two proportions? ● How would you determine whether the conditions were met for doing inference about $\mu_1 - \mu_2$? ● When is it appropriate to use two-sample t procedures versus paired t procedures?

6-8	Unit 11: Inference for Distributions of Categorical Data	<ul style="list-style-type: none"> ● State appropriate hypotheses and compute expected counts, and 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, and conduct a follow-up analysis when the results of a chi-square test are statistically significant. ● Compare conditional distributions, state appropriate hypotheses and compute expected counts, and calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test based on data in a two-way table. ● Choose the appropriate chi-square test, and perform a chi-square test for homogeneity or a chi-square test for independence. 	<ul style="list-style-type: none"> ● How do you compute and calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test for goodness of fit? ● How would you analyze the results of a chi-square test? ● How do you when to use a chi-square test for homogeneity or a chi-square test for independence?
6-8	Unit 12: More about Regression	<ul style="list-style-type: none"> ● Interpret the values of a, b, s, SE_b, and r^2 in context, and determine these values from computer output. ● Check the conditions for 	<ul style="list-style-type: none"> ● How would you interpret the values of a, b, s, SE_b, and r^2 in context? ● How would you interpret a

		<p>performing inference about the slope β, construct and interpret a confidence interval, and perform a significance test for the slope of the population regression line.</p> <ul style="list-style-type: none">● 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.	<p>confidence interval, and perform a significance test for the slope of the population regression line?</p> <ul style="list-style-type: none">● How would you use a power model that describes the relationship between two variables to make predictions?● How would you determine which transformation does a better job of producing a linear relationship?
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