AP Statistics
U-46 Curriculum Scope and Sequence

Reporting Strand	Instructional Focus	Semester
Exploring Data	Describing data numerically and graphically	1
	Modeling distributions of data	
	Describing relationships between two numerical variables	
Sampling & Experimentation	Sampling and surveys	1
	Experiments	
	Using studies wisely	
Anticipating Patterns	Probability	1
	Random Variables	1/2
	Sampling distributions	2
Statistical Inference	Estimating with confidence (One sample)	2
	Testing a claim (One sample)	
	Comparing two populations or groups	
	Inference for distributions of categorical data (Chi-square procedures)	
	More about regression (Lin-reg procedures)	

AP Statistics: Exploring Data

Describing data numerically and graphically				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Construct and interpret <u>all of the</u> following • Pie charts • Bar graphs • Two way tables using marginal distributions • Two way tables using conditional distributions • Dot plot/Stem plot • Histogram • Box plot Calculate, interpret and compare • Shape • Center • Spread • Outliers <u>Using correct academic vocabulary</u>	Construct <u>and interpret 6 of the following</u> • Pie charts • Bar graphs • Two way tables using marginal distributions • Two way tables using conditional distributions • Dot plot/Stem plot • Histogram • Box plot Calculate, interpret <u>and compare</u> • Shape • Center • Spread • Outliers	Construct <u>5 of the following</u> • Pie charts • Bar graphs • Two way tables using marginal distributions • Two way tables using conditional distributions • Dot plot/Stem plot • Histogram • Box plot Identify • Shape • Center • Spread • Outliers	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Exploring Data

Modeling distributions of data				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For given data set(s) describe and interpret <u>all of the following:</u> • Percentiles • A cumulative relative frequency graph • Z-scores • Comparing scores from different distributions • Effects on the shape, center, and spread when data is transformed For a data set that is continuous, determine and interpret <u>all of the following:</u> • Density curves • Empirical rule • Areas and percentiles • Normal distribution calculations in context • Assessment of Normality	For given data set(s) describe <u>and interpret</u> 4 of the following: • Percentiles • A cumulative relative frequency graph • Z-scores • Comparing scores from different distributions • Effects on the shape, center, and spread when data is transformed For a data set that is continuous, determine <u>and interpret</u> 4 of the following: • Density curves • Empirical rule • Areas and percentiles • Normal distribution calculations <u>in context</u> • Assessment of Normality	For given data set(s) describe <u>4 of the following:</u> • Percentiles • A cumulative relative frequency graph • Z-scores • Comparing scores from different distributions • Effects on the shape, center, and spread when data is transformed For a data set that is continuous, determine <u>4 of the following:</u> • Density curves • Empirical rule • Areas and percentiles • Normal distribution calculations • Assessment of Normality	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Exploring Data

Describing relationships between two numerical variables				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For a scatterplot, construct and describe the • Direction, form and strength of the pattern • Correlation • Outliers and influential observations Determine the least-squares regression line • With use of technology • From summary statistics • From computer output and interpret • the slope • y-intercept • residuals Use least-squares regression line to • predict values of the response variable • explain the dangers of extrapolation Assess the reliability of the regression line using all of the following: • residual plots • standard deviation of the residuals • r^2	For a scatterplot, construct and describe the • Direction, form and strength of the pattern • Correlation • Outliers Determine the least-squares regression line • With use of technology • From summary statistics • From computer output and interpret • the slope • y-intercept • residuals Use least-squares regression line to • predict values of the response variable • explain the dangers of extrapolation Assess the reliability of the regression line using 2 of the following: • residual plots • standard deviation of the residuals • r^2	For a scatterplot, construct and describe the • Direction, form and strength of the pattern • Correlation • Outliers Determine the least-squares regression line from 2 of the following: • With use of technology • From summary statistics • From computer output and identify • the slope • y-intercept • residuals Use least-squares regression line to • predict values of the response variable • identify extrapolation	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Sampling and Experimentation

Sampling and surveys				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For a sampling situation, describe <u>all of the following:</u> • The population and sample • Simple random samples • Stratified random samples • Cluster samples • Systematic random samples Obtain a simple random sample using <u>all of the following</u>: • A table of random numbers • A random number generator • The "hat method" Explain how the following can lead to bias in <u>all of the following</u>: • Voluntary response • Convenience samples • Undercoverage • Nonresponse • Response • Question wording	For a sampling situation, describe <u>4 of the following:</u> • The population and sample • Simple random samples • Stratified random samples • Cluster samples • Systematic random samples Obtain a simple random sample using <u>2 of the following</u>: • A table of random numbers • A random number generator • The "hat method" Explain how the following can lead to bias in <u>5 of the following</u>: • Voluntary response • Convenience samples • Undercoverage • Nonresponse • Response • Question wording	For a sampling situation, describe <u>3 of the following:</u> • The population and sample • Simple random samples • Stratified random samples • Cluster samples • Systematic random samples Obtain a simple random sample using <u>1 of the following</u>: • A table of random numbers • A random number generator • The "hat method" Explain how the following can lead to bias in <u>4 of the following</u>: • Voluntary response • Convenience samples • Undercoverage • Nonresponse • Response • Question wording	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Sampling and Experimentation

Experiments				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Distinguish between • observational study • an experiment • completely randomized designs • randomized block designs • matched pairs design Identify and explain the purpose of • control/comparison • randomization • replication • blinding In an experiment identify the following • experimental units • explanatory variables/factors • treatments • response variables Describe and diagram the following: • a completely randomized experiment • a randomized block design • a matched pair design Appropriately apply inference for • a population • cause and effect	Distinguish between • observational study • an experiment • completely randomized designs • randomized block designs Identify and explain the purpose of • control/comparison • randomization • replication • blinding In an experiment identify the following • experimental units • explanatory variables/factors • treatments • response variables Describe and diagram the following: • a completely randomized experiment • a randomized block design • a matched pair design	Distinguish between • observational study • an experiment • completely randomized designs Identify • control/comparison • randomization • replication In an experiment identify the following • experimental units • explanatory variables/factors • treatments • response variables Diagram the following: • a completely randomized experiment • a randomized block design • a matched pair design	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Probability				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Interpret probability as a long-run relative frequency. Design and conduct simulations to model chance behavior Complete a probability model for a chance process. Interpret probabilities in context by using relationships between the following • Complement rule • Addition rule • Multiplication rule • A created Venn diagram for two events • A created tree diagram Determine • Independence of events • Disjoint/mutually exclusive events • The probability of an event using two-way tables • Conditional probability	Interpret probability as a long-run relative frequency. Design and conduct simulations to model chance behavior Verify a probability model of a chance process. Interpret probabilities in context from • Complement rule • Addition rule • Multiplication rule • A created Venn diagram for two events • A created tree diagram Determine • Independence of events • The probability of an event using two-way tables • Conditional probability	Interpret probability as a long-run relative frequency. Conduct a given simulation to model chance behavior Identify the criteria for a probability model of a chance process. Calculate probabilities from • Complement rule • Addition rule • Multiplication rule • A given Venn diagram for two events • A given tree diagram Determine • Independence of events • The probability of an event using two-way tables	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Random Variables				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For discrete random variables • Identify • Calculate the mean and standard deviation • Calculate probabilities • Explain the effects of transforming a random variable • Determine the distribution of the sum or difference of two random variables For continuous random variables • Identify • Calculate probabilities using a normal curve • Explain the effects of transforming a random variable • Determine the distribution of the sum or difference of two random variables For binomial random variables • Identify binomial setting • Calculate the mean and standard deviation • Calculate probabilities with formulas and technology For geometric random variables • Identify geometric setting • Calculate the mean • Calculate probabilities with formulas and technology	For discrete random variables • Identify • Calculate the mean and standard deviation • Calculate probabilities • Explain the effects of transforming a random variable For continuous random variables • Identify • Calculate probabilities using a normal curve • Explain the effects of transforming a random variable For binomial random variables • Identify binomial setting • Calculate the mean and standard deviation • Calculate probabilities with formulas or technology For geometric random variables • Identify geometric setting • Calculate the mean • Calculate probabilities with formulas or technology	For discrete random variables • Identify • Calculate the mean and standard deviation • Calculate probabilities For continuous random variables • Identify • Calculate probabilities using a normal curve For binomial random variables • Identify binomial setting • Calculate the mean and standard deviation • Calculate probabilities with technology For geometric random variables • Identify geometric setting • Calculate the mean • Calculate probabilities with technology	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Sampling Distributions				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe and interpret • Parameter and a statistic • Population distribution, sampling distribution, and a distribution of sample data • An unbiased estimator of a population parameter • The relationship between sample size and the variability of a statistic For sample proportions • Calculate and interpret the mean • Calculate and interpret standard deviation • Use Normal approximation to calculate and interpret probabilities • Check for independence (10% rule) • Check for normality (np and n(1-p) ≥ 10) For sample mean • Calculate and interpret the mean • Calculate and interpret standard deviation • Use Normal approximation to calculate and interpret probabilities • Check for independence (10% rule) • Check for normality (central limit theorem)	Describe • Parameter and a statistic • Population distribution, sampling distribution, and a distribution of sample data • An unbiased estimator of a population parameter • The relationship between sample size and the variability of a statistic For sample proportions • Calculate and interpret the mean • Calculate and interpret standard deviation • Use Normal approximation to calculate probabilities • Check for independence (10% rule) • Check for normality (np and n(1-p) ≥ 10) For sample mean • Calculate and interpret the mean • Calculate and interpret standard deviation • Use Normal approximation to calculate probabilities • Check for independence (10% rule) • Check for normality (central limit theorem)	Identify • Parameter and a statistic • Population distribution, sampling distribution, and a distribution of sample data For sample proportions • Calculate the mean • Calculate standard deviation • Use Normal approximation to calculate probabilities For sample mean • Calculate the mean • Calculate standard deviation • Use Normal approximation to calculate probabilities	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Statistical Interference

Estimating with Confidence				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Interpret/explain all of the following: • A confidence level in context • A confidence interval in context • A confidence interval gives a range of plausible values for the parameter • Identify/verify and explain why each of the three inference conditions are important • How issues like nonresponse, undercoverage, and response bias can influence the interpretation of a confidence interval. • The effect of the sample size and the level of confidence C on the margin of error of a confidence interval Determine all of the following: • Critical values for calculating a confidence interval • the sample size required to obtain a level of confidence C interval for a population mean/proportion with a specified margin of error • sample statistics, margin of error, and confidence level from a confidence interval Construct and interpret a confidence interval for a population • mean • proportion	Interpret/explain all of the following: • A confidence level in context • A confidence interval in context • A confidence interval gives a range of plausible values for the parameter • Identify/verify each of the three inference conditions • The effect of the sample size and the level of confidence C on the margin of error of a confidence interval Determine all of the following: • Critical values for calculating a confidence interval • the sample size required to obtain a level of confidence C interval for a population mean/proportion with a specified margin of error • sample statistics from a confidence interval Construct and interpret a confidence interval for a population • mean • proportion	Interpret/explain all of the following: • A confidence interval in context • A confidence interval gives a range of plausible values for the parameter • The effect of the sample size and the level of confidence C on the margin of error of a confidence interval Determine all of the following: • Critical values for calculating a confidence interval • sample statistics from a confidence interval Construct a confidence interval for a population • mean • proportion	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Testing a Claim				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	List/verify conditions for carrying out a test • a proportion • a mean (including for small sample sizes) Use a confidence interval to draw a conclusion for a two-sided test about • a proportion • a mean Conduct • a one sample t test about a population mean μ • a significance test about a population proportion ρ Interpret • P-values in context • The relationship between a type I error and a type II error in context, and give the consequences of each. • ways to increase power of a test and the value of power.	List/verify conditions for carrying out a test • a proportion • a mean Use a confidence interval to draw a conclusion for a two-sided test about • a proportion • a mean Conduct • a one sample t test about a population mean μ • a significance test about a population proportion ρ Interpret • a type I error and a type II error in context, and give the consequences of each. • ways to increase power of a test and the value of power.	List conditions for carrying out a test • a proportion • a mean Conduct • a one sample t test about a population mean μ • a significance test about a population proportion ρ Describe • a type I error and a type II error in context • ways to increase power of a test	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Two Populations or Groups				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe the characteristics and calculate probabilities for • the sampling distribution of $\hat{p}_1 - \hat{p}_2$ • the sampling distribution of $\bar{x}_1 - \bar{x}_2$ Identify and verify whether or not the conditions for performing inference are met Construct and interpret • a two sample z interval to compare two proportions • a two-sample t interval to compare two means Perform • a two sample z test to compare two proportions • a two-sample t test to compare two means Interpret • p-value of the test • the results of inference procedures in a randomized experiment. Determine and explain the proper inference procedure to use in a given setting Recognize paired data and use one sample t procedures to perform significance tests for such data	Describe the characteristics and calculate probabilities for • the sampling distribution of $\hat{p}_1 - \hat{p}_2$ • the sampling distribution of $\bar{x}_1 - \bar{x}_2$ Identify and verify whether or not the conditions for performing inference are met Construct and interpret • a two sample z interval to compare two proportions • a two-sample t interval to compare two means Perform • a two sample z test to compare two proportions • a two-sample t test to compare two means Interpret the results of inference procedures in a randomized experiment. Determine the proper inference procedure to use in a given setting Recognize paired data and use one sample t procedures to perform significance tests for such data	Describe the characteristics and calculate probabilities for • the sampling distribution of $\hat{p}_1 - \hat{p}_2$ • the sampling distribution of $\bar{x}_1 - \bar{x}_2$ Identify the conditions for performing inference Construct • a two sample z interval to compare two proportions • a two-sample t interval to compare two means Perform • a two sample z test to compare two proportions • a two-sample t test to compare two means Determine the proper inference procedure to use in a given setting	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

Inference for Distribution of Categorical Data				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For a chi-square test for goodness of fit • Calculate the chi-square statistic, degrees of freedom, and P-value • State appropriate hypotheses and compute expected counts • Identify when a one sample z test for proportions gives equivalent results For a chi-square test based on data in a two-way table • Calculate the chi-square statistic, degrees of freedom, and P-value • State appropriate hypotheses and compute expected counts • Identify when a two sample z test for proportions gives equivalent results Choose the appropriate chi-square test and perform it for • goodness of fit. • Homogeneity • Independence Conduct a follow-up analysis when the results of a chi-square test are statistically significant.	For a chi-square test for goodness of fit • Calculate the chi-square statistic, degrees of freedom, and P-value • 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 • State appropriate hypotheses and compute expected counts Choose the appropriate chi-square test and perform it for • goodness of fit. • Homogeneity • Independence	For a chi-square test for goodness of fit • Calculate the chi-square statistic, degrees of freedom, and P-value • 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 • State appropriate hypotheses and compute expected counts	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

AP Statistics: Anticipating Patterns

More About Regression				
4	**3**	**2**	**1**	**0**
Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	For the slope of a population (true) regression line • Perform a significance test • Construct and interpret a confidence interval Interpret computer output from a least-squares regression analysis Determine which settings best apply to exponential and power models 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. • 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	For the slope of a population (true) regression line • Perform a significance test • Construct and interpret a confidence interval Interpret computer output from a least-squares regression analysis 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. • 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	For the slope of a population (true) regression line • Perform a significance test • Construct a confidence interval Interpret computer output from a least-squares regression analysis Use transformations involving • logarithms to find a power model or an exponential model that describes the relationship between two variables	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1