SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Advanced Placement Statistics	**Length of Course:** 30 cycles
Grade Level(s): 11 - 12	**Periods Per Cycle:** 6
Units of Credit: 1	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 129 hours

Course Description

The purpose of this advanced placement course is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will be exposed to three broad conceptual themes: *Exploring Data:* observing patterns and departures from patterns; *Planning a Study*: deciding what and how to measure; *Anticipating Patterns*: producing models using probability theory and simulation. The work in this course involves a high-level of critical thinking through the application of word problems as well as a major emphasis on graphing calculator problems.

Prerequisite: Successful completion of Trigonometry or Algebra 2 Honors

Instructional Strategies, Learning Practices, Activities, and Experiences

Anticipatory Sets	Graphic Organizers	Projects
Assessments	Guided Practice	Teacher Demonstrations
Class Discussions	High-Level Questioning	Technology Integration
Closure	Homework	Videos
Critical Thinking	Posted Objectives	Warm-ups
Flexible Groups		

Assessments

Assessments (Teacher-Created, College Board)	Projects	Classwork
Higher-Level Questioning		

Materials/Resources

Statistics: Learning from Data	Internet Resources	College Board Materials
Second Edition (Peck, Short, Olsen)		

Adopted: 5/21/12
Revised: 5/19/14; 5/20/2019

What is Statistics?	
The Standards of Mathematical Practices	
Make sense of problems and persevere in solving them. **Construct viable arguments and critique the reasoning of others.** **Use appropriate tools strategically.** **Look for and make use of structure.**	**Reason abstractly and quantitatively.** **Model with mathematics.** **Attend to precision.** **Look for and express regularity in repeated reasoning.**
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
What is Statistics? • Define and apply basic statistics terms such as population, individual, variables, distribution, lurking variables, probability, observational study and an experiment • Classify a variable as categorical or quantitative • Identify lurking variables in statistical situations • Create and label parts of a bar graph • Define and provide example for a statistical inference	**CC.2.4.8.B.2** - Understand patterns of association can be seen in bivariate data utilizing frequencies. **CC.2.4.HS.B.2** - Summarize, represent, and interpret data on two categorical and quantitative variables.

Analyzing Data: Looking for Patterns and Departures from Patterns	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Analyzing Data: Looking for Patterns and Departures from Patterns • Apply and interpret variety of graphical displays including bar graphs, boxplots, stemplots, histograms, pie charts, and timeplots • Apply variety of numerical techniques to describe a distribution including mean, median, quartiles, standard deviation, and variance • Apply and interpret linear transformations • Calculate and interpret standardized values (z-scores) and percentile ranks • Interpret a density curve • Create a normal probability plot using a variety of techniques • Apply technology and tables to find proportions of values in different intervals (left-tail, right-tail, 2-tail) • Create and interpret a scatterplot • Calculate and interpret correlation r between two variables • Identify and explain characteristics of correlation r • Create and interpret a regression line including its appropriateness as a model for bivariate data • Identify situations where a transformation should be applied to produce linearity • Create transformations applying logs and powers • Create, explain and interpret a two-way table • Provide applications of Simpson's paradox • Interpret causation and how it applies to a variety of situations	**CC.2.4.8.B.2** - Understand patterns of association can be seen in bivariate data utilizing frequencies. **CC.2.4.HS.B.2** - Summarize, represent, and interpret data on two categorical and quantitative variables. **CC.2.4.HS.B.1** - Summarize, represent, and interpret data on a single count or measurement variable. **CC.2.4.HS.B.3** - Analyze linear models to make interpretations based on the data.

Producing Data: Surveys, Observational Studies, and Experiments	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Producing Data: Surveys, Observational Studies, and Experiments • Compare and contrast experiments vs. observational studies, identifying each in practice • Identify and apply a variety of sampling methods • Define and apply simple random sampling • Define sources of bias and identify them in practice • Identify and explain three basic principles of experimental design • Define randomization and blocking, demonstrating how each fits into an experimental design • Use a random number table or technology to find a random sample	**CC.2.4.HS.B.5** - Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. **CC.2.4.HS.B.4** - Recognize and evaluate random processes underlying statistical experiments.

Probability and Random Variables: Foundations for Inference	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Probability and Random Variables: Foundations for Inference • Create a simulation of a probability event using a random number table and technology • Apply basic rules of probability and general addition and multiplication rules to solve problems • Define a sample space and create one for a given probability event • Calculate a conditional probability • Define and explain common probability terms like union, intersection, independence, etc. • Distinguish between a discrete and continuous random variable • Define and apply a probability distribution for a random variable • Apply law of large numbers • Calculate the mean and variance of a discrete random variable • Calculate the mean and variance of distributions formed by combining two random variables • Define a binomial setting and a binomial distribution • Calculate the mean and variance of a binomial random variable • Apply normal approximation to solve a binomial probability problem • Define and apply geometric setting calculate the mean and variance of a geometric random variable	**CC.2.4.HS.B.7** - Apply rules of probability to compute probabilities of compound events in a uniform probability model. **CC.2.4.HS.B.6** - Use the concepts of independence and conditional probability to interpret data.

Probability and Random Variables: Foundations for Inference (continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Probability and Random Variables: Foundations for Inference • Define sampling distribution, bias, variability, and sampling distribution of a sample mean • Describe the sampling distribution of a sample proportion • Apply a normal approximation to solve probability problems • Apply the central limit theorem • Solve probability problems using the sampling distribution of a sample mean	

Inference: Conclusions with Confidence	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Inference: Conclusions with Confidence • Define statistical inference, confidence intervals and margin of error • Create and interpret a confidence interval for a population mean and for a population proportion • Find the sample size to create a confidence interval for a fixed margin of error • Compare and contrast the t- and normal distributions • List conditions needed to create a confidence interval for a population mean or a population proportion • Describe the logic of significance testing create, compare and contrast a null hypothesis and an alternative hypothesis • Compare two-sided significance tests and confidence intervals when doing inference • Compare and contrast statistical and practical "significances" • Define and apply the two types of errors in hypothesis testing • Define and apply the power of a test • Complete one-sample and paired data t-significance tests • Compare and contrast a one-sample confidence interval for a population proportion and a one-sample significance test for a population proportion • Identify conditions needed to do inference for comparing two population means	**CC.2.4.HS.B.5** - Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

Inference: Conclusions with Confidence (continued)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Inference: Conclusions with Confidence • Create a confidence interval for the difference between two population means • Complete a significance test for the difference between two population means • Identify conditions needed to do inference for comparing two population proportions • Create a confidence interval for the difference between two population proportions • Complete a significance test for the difference between two population proportions • Define and apply a chi-square goodness of fit test • Calculate conditional distributions when provided a two-way table • Conduct a chi-square test for homogeneity of populations and for association/independence • Identify and apply the conditions required for doing inference by regression • Calculate the confidence interval for the slope of the regression line • Conduct test of the hypothesis that the slope of the regression line in 0 (i.e. correlation is 0)	