DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

AP Statistics

Grade Level: 10-12

Date of Board Approval: _____2018_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: AP Statistics

Subject Area: Mathematics Grade(s): 10-12

Course Description:

The curriculum for AP Statistics is intended to meet the standards of the College Board's AP Statistics program. As such, it is the high school equivalent of a one semester, introductory college statistics course. In this course, students develop strategies for collecting, organizing, analyzing, and drawing conclusions from data. Students design, administer, and tabulate results from surveys and experiments. Probability and simulations aid students in constructing models for chance phenomena. Sampling distributions provide the logical structure for confidence intervals and hypothesis tests. Students use a TI-84 graphing calculator, Fathom statistical software, and Web-based java applets to investigate statistical concepts. To develop effective statistical communication skills, students are required to prepare frequent written and oral analyses of real data.

The course's four main units are designed to comprehensively cover the skills and concepts necessary for success equivalent to those requirements for the College Board's program for Advanced Placement Statistics, and will do so in time for the AP Statistics exam in early May. Topics and activities after that exam will be included to extend and apply the concepts of Statistics.

This course is available to students in grades 10-12 who have demonstrated mastery in Algebra II or Precalculus, or in Honors Geometry. Students in grades 10-11 taking this course will do so as an elective *in addition* to their regularly assigned mathematics course.

Time/Credit for the Course:

FULL YEAR, 1 CREDIT, 1 PERIOD/DAY

Curriculum Writing Committee:

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Curriculum Map

1. **Unit One – Elementary Data Analysis - Overview with time range in days:** 43 days
   Construct and interpret graphical displays of distributions of univariate data, either categorical or quantifiable. Summarize distributions, using shape, center, spread, and outliers, in context. Compare distributions using graphs or written comparisons. Identify patterns and relationships in bivariate data. Compare and interpret measures of center and spread. Describe the effects of linear transformations on shape, center, and spread of a quantitative variable. Use standardized scores to describe position within a distribution. Identify and apply properties of density curves. Recognize properties of Normal distributions. Assess the Normality of a distribution of quantitative data. Identify explanatory and response variables in context of bivariate data, and use a scatterplot to describe the association using direction, form, and strength in context. Measure and interpret correlation and r-squared between quantitative variables and slope of the least squares regression line. Assess the quality of a LSRL model using residuals. Apply appropriate transformations to achieve linearity. Describe and analyze associations between categorical variables using tables and charts.

   Unit One - Goals:
   Understanding of:
   - Appropriate graphs for various contexts and variables – categorical and quantitative.
   - Describing Location in a Distribution.
   - Examination of Relationships between quantitative variables.
   - Use of linear regression models to predict values of one variable from another.
   - Relationships between categorical variables.
   - Reasons for relationships, including causation, confounding, and common response.

2. **Unit Two – Data Production:** 21 days
   Compare and contrast use of various sampling designs and justify why randomness is important in sampling. Compare and contrast observational studies and experiments, identifying the advantages and disadvantages of each. Identify causes of bias. Design surveys to avoid bias. Identify the important features of an experimental design, including completely randomized designs, randomized block designs, and matched pairs designs and how they work.

   Unit Two -Goals:
   Understanding of:
   - Sampling;
   - Causes of Bias involved in inferior sampling situations;
   - Methods for selection of a SRS (simple random sample);

- Cluster sampling and how it differs from other methods;
- Stratified Random Sampling, when and how to use it, and how it reduces sampling variability.
- Experiments and how they differ from Observational Studies;
- Block design and matched-pairs design.

3. **Unit Three – Probability / Anticipating Patterns:** 39 days
   Describe and measure probability using simulation. Calculate probabilities of simple and complex events. Model probabilities using Venn Diagrams, contingency tables, and tree diagrams. Combine independent random variables. Use the Normal distribution to find probabilities of Normal random variables and combinations of them. Identify and describe sampling distributions.

   Unit Three - Goals
   Understanding of:
   - Use simulations to estimate probabilities of events;
   - Describe the steps of simulations using various tools;
   - Apply probability rules, such as the addition and multiplication rules to determine probabilities, including conditional probabilities;
   - Describe continuous and discrete random variables and their properties;
   - Describe the effects of linear transformations on random variables;
   - Find the sum and differences of independent random variables;
   - Model and solve probability problems with random variables;
   - Describe the properties of Binomial and Geometric random variables;
   - Find probabilities using binomial and discrete random variables;
   - Bias and variability of a statistic;
   - Describe the sampling distribution of a statistic;
   - Describe the properties of the sample mean and sample proportion;
   - Use the Central Limit Theorem to describe the sampling distribution of a sample mean;

4. **Unit Four – Statistical Inference:** 46 days
   Right triangle relationships circles, arc and angle relationships, circles as the limit of a regular polygon as n goes to infinity, solid geometry, volume.

   Unit Four -Goals:
   Understanding of:
   - Construction and interpretation of Confidence Intervals;
   - The conditions for inference for CIs;
   - The effect of sample size on sampling variability;
   - The T-distribution and the Z-distribution and when they apply;

- The robustness of t procedures;
- Paired t procedures
- Significance testing, null and alternate hypotheses, and p-value;
- Type I and Type II errors and their consequences;
- One sample Z and T tests and one proportion Z tests;
- Tests for two independent samples: 2-sample T-tests, 2-proportion Z-tests;
- Chi-Square tests for Goodness of Fit
- Chi-Square tests for Homogeneity and Independence;
- Application of transformations to achieve linearity in non-linear contexts.
- Linear Regression T-tests;

5. **Unit Five – Connections, Review, Extensions:** 31 days
   Review of all AP Statistics topics, increased focus on choosing an appropriate inference procedure for a given situation. Practice in taking AP Statistics exams and in scoring AP Statistics Free Response questions. Extensions of the AP Statistics Curriculum, including One-Way ANOVA, and multiple linear regression modeling.

   Unit Five - Goals:
   Understanding of:
   - Layout of the AP Statistics exam, and timing of the test items.
   - The essential elements of a well-written response to free-response items.
   - One-Way ANOVA, between-group and within-group variability;
   - Multiple linear regression through the use of computer tools.

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Curriculum Plan

Unit: 1 **Time Range in Days:** 43 days

Standard(s): College Board Advanced Placement Statistics Course Description
https://secure-media.collegeboard.org/ap-student/course/ap-statistics-2010-course-exam-description.pdf

Standards Addressed:
CB AP Stat: AP Stat – IA, IB, IC, ID, IE

Big Idea # 1:
Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

Essential Questions:
- How does one use graphical and numerical techniques to study patterns and departures from patterns?
- How does one measure the location of an individual within a distribution?

Concepts:
- Distributions of categorical and quantifiable variables
- Standardization of values: z-scores
- Association between pairs of variables

Competencies:
- Construct and interpret graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot).
- Summarize distributions of univariate data.
- Compare distributions of univariate data
- Analyze bivariate data
- Analyze categorical data

Overview: Exploring Data: Describing patterns and departures from patterns

Goals: Students will be able to construct and interpret graphical displays of distributions of univariate data, either categorical or quantifiable, summarize distributions of univariate data, compare distributions of univariate data, and analyze bivariate data.

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Objectives:

- Create a stem plot or histogram of the distribution of a quantitative variable, assessing whether trimming numbers or splitting stems as is appropriate, or choosing appropriate bin widths. (DOK – Level 1,2,3,4)
- Construct and interpret an ogive of a set of data. (DOK – Level 1,2,3)
- Assess and analyze the shape of a distribution. (DOK – Level 3,4)
- Describe the pattern of a set of data using measures of center and spread. (DOK – Level 1,2,3)
- Apply knowledge of the difference between measures of center and spread to use the appropriate measures to assess center and spread and identify outliers. (DOK – Level 2,3,4)
- Make a time plot of data and recognize and identify strong trends. (DOK – Level 1,2,3)
- Calculate means, medians, standard deviations, IQRs, and ranges for sets of data and apply and interpret these in context. (DOK – Level 1,2,3,4)
- Find the standardized value of an observation and interpret those scores in context. (DOK – Level 3,4)
- Express individual values in terms of their percentiles, and interpret those percentiles in context.
- Summarize the properties of a density curve, and locate its approximate mean, median, and mode. Compare the mean and median for a given density curve. (DOK – Level 1,2,3,4)
- Describe the shape of Normal curves and estimate both the mean and the standard deviation of a Normal density curve. (DOK – Level 1,2,3)
- Apply the 68-95-99.7 rule and symmetry to estimate the proportion of observations between two points lying at one, two, or three standard deviations on either side of the mean. (DOK – Level 1,2)
- Apply the standard Normal distribution to calculate the proportion of values between two points, and to determine a z-score from a percentile, using a table and/or a graphing calculator and interpret the result in context. (DOK – Level 1,2,3,4)
- Calculate the point having a given proportion of values above or below it in a Normal distribution with given mean and standard deviation, and interpret the result in context. (DOK – Level 1,2,3,4)
- Classify variables as quantitative or categorical, and identify explanatory and response variables in bivariate data sets when one variable explains or influences another. (DOK – Level 2,3,4)

- Construct a scatterplot to display the association between quantitative variables. Further analyze the relationship by adding a categorical variable using different symbols in a scatterplot. (DOK – Level 1,2,3)
- Describe the association between quantitative variables in terms of its direction, form and strength in context. Identify outliers. (DOK – Level 2,3,4)
- Use technology to calculate and interpret the correlation coefficient between two quantitative variables. (DOK – Level 1,2,3,4)
- Describe the properties of r, the correlation coefficient. (DOK – Level 1,2,3)
- Define, calculate and interpret the Least Squares Regression Line (LSRL). (DOK – Level 1,2,3,4)
- Interpret the slope and y-intercept of the LSRL in context. (DOK – Level 1,2,3,4)
- Interpret the value of the coefficient of determination (r-squared) for a LSRL in context. (DOK – Level 1,2,3,4)
- Use the regression line to predict a value of y from a given value of x. Recognize extrapolation and critique the validity of a prediction involving extrapolation. (DOK – Level 1,2,3,4)
- Calculate a residual for a given observation and interpret in context. (DOK – Level 1,2,3,4)
- Assess the quality of a linear model by constructing a residual plot. (DOK – Level 1,2,3,4)
- Identify outliers and possibly influential observations in an association between quantitative variables. (DOK – Level 1,2,3,4)
- Recognize spurious associations between variables and critique them, identifying possible lurking variables that may explain the association. (DOK – Level 1,2,3,4)
- Use powers of one variable to achieve linearity when there is a clearly non-linear relationship. (DOK – Level 1,2,3,4)
- Assess the quality of a model and compare the quality of alternative models by constructing and comparing residual plots. (DOK – Level 3,4)
- From a contingency table, find marginal distributions and conditional distributions of a categorical variable. (DOK – Level 1,2,3)
- Describe the relationship between two categorical variables by computing and comparing proportions in circle graphs or parallel ribbon charts. (DOK – Level 1,2,3,4)
- Show the possible effect of lurking variables on the relationship between two categorical variables and explain how this can happen in context. (DOK – Level 3,4)

- Identify possible lurking variables that may explain the observed association between two variables; make an argument about whether the observed association may be due to causation, common response, or confounding. (DOK – Level 3,4)

Core Activities and Corresponding Instructional Methods:

1. Students select a set of 8 to 10 variables to observe and record data among members of the class. They classify the variables as categorical or quantitative, and in teams select what they believe to be the most interesting ones to analyze using a graph. They construct appropriate graphs, and describe the distributions, compare the distributions across a binary variable, and describe associations in context.
2. Students collect data from a set of objects such as tennis balls and analyze the set of circumferences graphically and numerically, describing the distribution in context and interpreting the variability in terms of the standard deviation and IQR.
3. Students collect data on a selected variable for the set of students, such as student height, compute individual percentiles, and construct and interpret an ogive of the data.
4. Students use Fathom software to explore a set of data and evaluate how far an individual value must differ from the rest before it is identified as an outlier.
5. Students use census data to evaluate the effect of individual data on measures of center and spread.
6. Students play a game of “Simon Says” where teacher calls out instructions such as “add 5,” or, “multiply by 2” where students represent individual values on a number line at the front of the room. Students describe the effect of these linear transformations on the shape, center, and spread of the distribution of data.
7. Students collect data on fine-finger dexterity in bead counting exercise, comparing the distributions of times for males and females in context.
8. Students collect arm span and height data and make scatterplots on a graphing calculator, describing the association between them in context. They calculate the correlation and interpret it.
9. Students select a set of variables that they propose will help to predict the distance that a launched stomp rocket would travel when launched by each individual student. Students calculate, compare, and interpret r-squared values for each variable when associated with launch distance.
10. Students become “the claw,” capturing as many starburst candies from a bowl as they can, and then analyze the correlation between various body measurements with the number of starbursts they can hold.

11. Students collect data on non-linear relationships (number of cheerios to fill round plates of various diameters, number of pendulum swings in a given time for different lengths of string) and use transformations to model it using LSRL on transformed data.
12. Students discuss a set of possibly spurious correlations and propose possible reasons for the perceived associations.

Assessments:

Diagnostic: Teacher prepared diagnostic test, Teacher questioning and observation

Formative:

- Teacher observations, questions,
- Group activities
- Homework
- Teacher prepared assessments
- Past AP Statistics free response questions and rubrics

Summative:

- Cumulative Final Sub-unit/Chapter Assessments
- Review Assignment during Winter Recess

Extensions:

- resource applications and extensions

Correctives:

- practice worksheets
- Chapter review assignments

Materials and Resources:

- AP Statistics textbook, Chapters 1-4
- Fathom
- Practice worksheets, summary sheets
- Past AP Statistics free-response questions
- Graphing calculator

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Unit: **2** **Time Range in Days:** 21 days

Standard(s): College Board Advanced Placement Statistics Course Description
https://secure-media.collegeboard.org/ap-student/course/ap-statistics-2010-course-exam-description.pdf

Standards Addressed:
CB AP Stat: AP Stat – IIA, IIB, IIC, IID

Big Idea # 1:

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

Essential Questions:

- How do you use of graphical and numerical techniques to study patterns and departures from patterns?
- How do you measure the location of an individual within a distribution?

Concepts:

- Distributions of categorical and quantifiable variables
- Standardization of values: z-scores
- Association between pairs of variables

Competencies:

- Construct and interpret graphical displays of distributions of univariate data (dot plot, stem plot, histogram, cumulative frequency plot).
- Summarize distributions of univariate data.
- Compare distributions of univariate data
- Analyze bivariate data
- Analyze categorical data

Overview: Sampling and Experimentation: Planning and conducting a study

Goals: Students will be able to design observational studies using appropriate sampling techniques and identify possible sources of bias. They will be able to design experiments and make appropriate inferences from them.

Objectives:

- Identify the population in a sampling situation. (DOK – Level 1,2)
- Recognize, assess bias due to voluntary response sampling and other inferior sampling methods. (DOK – Level 1,2,3)

- Design a method for selecting a simple random sample from a population. (DOK – Level 2,3,4)
- Recognize cluster sampling and assess how it differs from other sampling methods. (DOK – Level 1,2,3)
- Recognize/assess the presence of undercoverage and nonresponse as sources of error in a sample survey, and the effect of the wording of questions on the response (DOK – Level 2,3,4)
- Use random digits to select a stratified random sample from a population when the strata are identified, and design a stratified random sampling technique, justifying the choice of variables on which to stratify. (DOK – Level 2,3,4)

Core Activities and Corresponding Instructional Methods:

1. Students try to estimate the average area of 100 rectangles on a sheet of paper, then try to choose a representative sample of five of them, then use their calculator to select a random sample, finding out that the random sample does a better job of representing the population of 100 rectangles than either of the two human-based methods.
2. Students identify and contrast different sampling methods based on a set of diagrams of populations.
3. Students write a procedure to use a random digit table to generate different kinds of random samples.
4. Students calculate mean yields of corn from a field with 100 subplots using convenience samples, simple random samples, and stratified samples and contrast the bias and variability in the class results.
5. Students design and diagram an experiment to test the effect of dark chocolate on pulmonary health based on an article in a health magazine.
6. Students employ a randomized block design to test the effect of changing the angle of a popsicle-stick launcher on the flying distance of gummy bears.
7. Students perform a simulation of two experimental designs – completely randomized and randomized block – to test the effect of calcium supplements and exercise on canine bone density loss.

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Assessments:

Diagnostic: Teacher prepared diagnostic test, Teacher questioning and observation

Formative:

- Teacher observations, questions,
- Group activities
- Homework
- Teacher prepared assessments
- Past AP Statistics free response questions and rubrics

Summative:

- Cumulative Final Sub-unit/Chapter Assessments
- Review Assignment during Winter Recess

Extensions:

- resource applications and extensions

Correctives:

- practice worksheets
- Chapter review assignments

Materials and Resources:

- AP Statistics textbook, Chapter 5
- Fathom
- Practice worksheets, summary sheets
- Past AP Statistics free-response questions
- Graphing calculator

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Unit: **3** **Time Range in Days:** 39 days

Standard(s): College Board Advanced Placement Statistics Course Description
https://secure-media.collegeboard.org/ap-student/course/ap-statistics-2010-course-exam-description.pdf

Standards Addressed:

CB AP Stat: AP Stat – IIIA, IIIB, IIIC, IIID

Big Idea # 1:

Probability is the tool used for anticipating what the distribution of data should look like under a given model. Probability is the basis for statistical inference.

Essential Questions:

- What is probability, how can one measure it, and what rules apply for simple and complex events?
- What is the difference between a discrete and random variable, and what rules apply to their means and variances for linear combinations and sums and differences of random variables?
- What are the characteristics of a binomial or geometric setting and how does one measure binomial or geometric probability models?
- What is a sampling distribution, and what is the distribution of the sample proportion and sample mean?

Concepts:

- Probability via simulation
- Probability models and calculations
- Random variables and properties
- Binomial and Geometric Random Variables
- Sampling distributions, bias and variability
- The Central Limit Theorem

Competencies:

- Estimate, calculate and interpret probabilities of random events
- Identify random variables and describe their distributions
- Identify and describe Binomial and Geometric random variables
- Describe and interpret Sampling Distributions

Overview: Anticipating Patterns: Exploring random phenomena using probability and simulation

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Goals: Students will be able to construct and interpret graphical displays of distributions of univariate data, either categorical or quantifiable, summarize distributions of univariate data, compare distributions of univariate data, and analyze bivariate data.

Objectives:

- Recognize that many random phenomena can be investigated using simulation, and design a simulation to do so. (DOK – Level 1,2,3,4)
- Construct a process to use a random digit table to conduct a simulation. (DOK – Level 1,2,3)
- Describe the sample space of a random phenomenon. (DOK – Level 1,2)
- Apply rules of probability to find the probability of simple and complex events. (DOK – Level 2,3)
- Determine if two events are disjoint, complementary, or independent. Analyze and justify whether these terms infer the others. (DOK – Level 2,3,4)
- Use Venn Diagrams and Tree Diagrams to model complex random phenomena. (DOK – Level 2,3,4)
- Understand the idea of independence and judge when it is reasonable to assume independence in a real world probability model. (DOK – Level 1,2,3,4)
- Apply the addition rule and multiplication rule and analyze conditional probabilities in real world and theoretical problems. (DOK – Level 2,3,4)
- Recognize and define a discrete random variable, and construct a probability distribution table and histogram. (DOK – Level 1,2,3)
- Recognize and define a continuous random variable, and represent, analyze and determine probabilities as areas under density curves. (DOK – Level 2,3,4)
- Model real world problems and evaluate probabilities related to Normal random variables and combinations of them using the Standard Normal curve. (DOK – Level 1,2,3,4)
- Calculate the mean and variance of a discrete random variable. (DOK – Level 1,2)
- Apply rules for means and variances to solve problems and interpret results involving sums, differences, and linear combinations of random variables (DOK – 3, 4)
- Identify properties of a binomial setting, and evaluate a real world setting for a binomial distribution and if justified, model with a binomial RV. (DOK – Level 3,4)
- Calculate binomial probabilities, and the mean and standard deviation of a binomial random variable. (DOK – level 1,2)

- Identify properties of a geometric setting, and evaluate a real world setting for a binomial distribution and if justified, model with a geometric RV. (DOK – Level 3,4)
- Calculate geometric probabilities, and the mean and standard deviation of a geometric random variable. (DOK – level 1,2)
- Identify parameters and statistics in a sample or experiment. (DOK – level 1)
- Evaluate, using simulation, the bias and variability inherent in a given statistic. (DOK – level 3)
- Understand that variability of a statistic decreases as the size of the sample increases. (DOK – level 2)
- Assess when a real world situation calls for investigation of the sample proportion or sample mean. (DOK- level 3)
- Evaluate the effect of a larger sample size on variability using the square root of n rule, and assess when it is reasonable to assume approximate independence. (DOK – level 2,3)
- Analyze and critique the effect of a larger n or various shapes of populations on the approximate Normality of the sampling distribution. (DOK – level 4)
- Assess when it is reasonable to use a Normal model to calculate probabilities involving sample means or sample proportions. (DOK – level 3)

Core Activities and Corresponding Instructional Methods:

1. Students work in teams to create their own statistic to estimate the number of tanks in a simulated German fleet during WW2. They compare the results of their different statistics by comparing a computer simulation using their chosen statistic, comparing the distributions and evaluating them for bias and variability.
2. Students use real world AIDS data to compute conditional probabilities and evaluate a reverse-conditioning probability problem, the likelihood that someone who tests positive for AIDS actually has AIDS.
3. Students create probability-based casino games of chance that will entice the player to play them while very likely producing, in the long run, a profit for the “house.”
4. Students create sets of real-world problems, those that call for analysis of the sample proportion, and another that calls for analysis of the sample mean. Teams of students describe the sampling distribution of those statistics, and determine the probability that the proportion or the mean exceeds a specified value.
5. Students apply binomial and geometric probability models to solving problems loosely based on the Twelve Days of Christmas.

6. Students collect data on bead color and penny age, comparing in the latter case, the distributions of the sample against the sampling distribution of samples of varying sizes.
7. Students construct simulations and perform them to estimate difficult to calculate probabilities, such as the probability that a Secret Santa selection yields no one getting themselves or the Duck Hunter simulation estimating the number of ducks that survive out of a set of ten.

Assessments:

Diagnostic: Teacher prepared diagnostic test, Teacher questioning and observation

Formative:

- Teacher observations, questions
- Group activities
- Homework
- Teacher prepared assessments
- Past AP Statistics free response questions and rubrics

Summative:

- Cumulative Final Sub-unit/Chapter Assessments
- Review Assignment during Winter Recess

Extensions:

- resource applications and extensions

Correctives:

- practice worksheets
- Chapter review assignments

Materials and Resources:

- AP Statistics textbook, Chapter 6-9
- Fathom
- Practice worksheets, summary sheets
- Past AP Statistics free-response questions
- Graphing calculator

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Unit: **4** **Time Range in Days:** 46 days

Standard(s): College Board Advanced Placement Statistics Course Description
https://secure-media.collegeboard.org/ap-student/course/ap-statistics-2010-course-exam-description.pdf

Standards Addressed:

CB AP Stat: AP Stat – IVA a-h

Big Idea # 1:

Statistical inference guides the selection of appropriate models.

Essential Questions:

- What is a sample and a population of interest?
- What is a confidence interval and how does one construct one?
- How does one test a null hypothesis?
- What tests or confidence intervals apply to estimating or testing proportions?
- What tests or confidence intervals apply to estimating or testing means?
- What tests apply to distributions of categorical variables?
- What tests or confidence intervals apply to regression?

Concepts:

- The logic of confidence intervals
- Estimation of a population mean or proportion
- The logic of hypothesis tests
- Testing against a hypothesized mean or proportion
- Type I error, Type II error, Power
- Tests for comparing means or proportions
- Tests for distributions of categorical variables
- Tests for association between two categorical variables
- Tests for regression

Competencies:

- Construct and interpret graphical displays of distributions of univariate data (dot plot, stem plot, histogram, cumulative frequency plot).
- Summarize distributions of univariate data.
- Compare distributions of univariate data
- Analyze bivariate data
- Analyze categorical data

Overview: Statistical Inference: Estimating population parameters and testing hypotheses

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Goals: Students will be able to choose and apply any of the statistical inference procedures listed above to a real world situation verifying conditions and communicating effectively the conclusion that can be made.

Objectives:

- Evaluate the validity for statistical inference procedures, analyzing whether conditions for inference, such as randomness, normality, and independence are met. (DOK – Level 3,4)
- Construct confidence intervals for the population mean or proportion or mean difference of paired data and interpret results. (DOK – Level 2,3,4)
- Assess the effect of varying sample sizes on the margin of error, and determine the necessary sample size to constrain the margin of error to a desired level. (DOK – Level 2,3,4)
- Understand the possible errors and abuses made in faulty use of inference procedures and critique real world studies for them. (DOK – Level 2,3,4)
- Identify and contextualize type I and type II errors in a significance testing situation assess/critique which type of error seems more serious for a given context. (DOK – Level 3,4)
- Compare the t-distribution against the z-distribution, explain when use of t-procedures is necessary, and assess real world problems for use of t. (DOK – Level 1,2,3,4)
- Construct confidence intervals or perform hypothesis tests for differences in two proportions or means with independent samples, and interpret results. (DOK – Level 3,4)
- Assess situations and apply appropriate Chi-Squared procedures to perform Goodness-of-fit tests, and tests for independence and homogeneity, checking conditions and interpreting results. (DOK – level 2,3,4)
- Recognize exponential growth. (DOK – Level 1,2,3)
- For exponential and power models, use logarithmic transformation to achieve linearity, make a prediction from a value of the explanatory variable and re-express in terms of the original context. (DOK – Level 1,2,3,4)
- Assess situations and apply linear regression t-tests and t-intervals, checking conditions and interpreting results. (DOK – level 2, 3, 4)

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Core Activities and Corresponding Instructional Methods:

1. Students draw samples randomly from a known population from a set of cards. They construct confidence intervals and combine results with the rest of the class to produce a graph displaying how many of the different CIs were successful at capturing the true value of the mean number on the cards.
2. Students draw various size samples from the same population and observe the effect on the margin of error by making parallel graphs. They compare this with larger sets from Fathom and write a conclusion about what they see.
3. Students are given a set of various real-world situations and work in teams to discuss what would constitute a type-one error and a type-two error, debating over which one is more serious. They decide on an appropriate alpha level, justifying their decision based on the result of their discussion.
4. Students work in teams evaluate two kinds of candy – starbursts and mounds bars – and are given manufacturer claims about the proportions of different colors or estimates for the mean weight of the candy. They choose a valid inference procedure, draw random samples, and analyze whether manufacturer targets are not being met. They work in teams to produce an oral and a written report.
5. Student teams perform tests they propose to do in class on gender-based studies (e.g., do boys, on average, have better fine finger dexterity than girls) and do the inference procedure they propose, producing oral and written reports. They also explain why they can't use their study to infer causation.
6. Students analyze random samples of M&M candies to evaluate whether Mars Company's claimed color distributions are being met.
7. Students compare multiple random samples of M&M candies from different sources to evaluate whether color distribution is independent of the source of the M&M candies.
8. Students collect arm span and height data and perform a linear regression t-test, interpreting results in context.

Assessments:

Diagnostic: Teacher prepared diagnostic test, Teacher questioning and observation

Formative:

- Teacher observations, questions,

- Past AP Statistics free response questions and rubrics

Summative:

- Cumulative Final Sub-unit/Chapter Assessments
- Review Assignment during Winter Recess

Extensions:

- resource applications and extensions

Correctives:

- practice worksheets
- Chapter review assignments

Materials and Resources:

- AP Statistics textbook, Chapters 10-15
- Fathom
- Practice worksheets, summary sheets
- Past AP Statistics free-response questions
- Graphing calculator

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Unit: **5** **Time Range in Days:** 31 days

Standard(s): College Board Advanced Placement Statistics Course Description
https://secure-media.collegeboard.org/ap-student/course/ap-statistics-2010-course-exam-description.pdf

Standards Addressed:
CB AP Stat: AP Stat – All standards

Big Idea # 1:

Statistics, and in particular, the material on the AP Statistics syllabus, is a set of interconnected topics and student success on the AP Test is dependent, in part, on being able to apply and interpret results, justifying why they use the procedures chosen and what the results mean in context. Post-AP topics, such as one-way ANOVA and multiple linear regression, help students further make these connections and extend their inference capabilities and understanding.

Essential Questions:

- What are the big ideas we've studied in the AP Syllabus?
- How does one test for the differences between more than two means?
- How does one construct a model for predicting a quantifiable response from multiple quantifiable explanatory variables?

Concepts:

- AP Statistics Exam review
- One-way ANOVA
- Multiple Linear Regression

Competencies:

- Take and score AP Exam responses
- Perform a one-way ANOVA procedure
- Construct, interpret, and apply a linear model based on multiple explanatory variables

Overview: AP Statistics Review and Extensions

Goals: Students will score well on the AP Statistics Examination; will extend their learning in post-AP topics, including one-way ANOVA and multiple linear regression.

Objectives:

- Students will be able to score a peer's responses using the AP rubric, assessing each other's results. (DOK – Level 4)

- Given a full released AP examination, students will assess their work on it according to AP rubrics and scoring guides, critiquing where are possible areas of improvement and assessing their own rate of completion. (DOK – Level 4)
- Students will apply one-way ANOVA to compare more than two population means and interpret results in context. (DOK – Level 3,4)
- Students will construct a linear model based on multiple explanatory variables and interpret results in context. (DOK – Level 3,4)

Core Activities and Corresponding Instructional Methods:

1. Students work in a timed format, taking selected AP free response questions and writing responses. They then work in teams, grading each other's responses according to the AP rubric, and self-assessing in writing how they could have scored better.
2. Students take full, released AP examinations from 2002, 2007, 2012, scoring each other's free response questions and combining their own scores with their multiple choice scores to receive a simulated AP exam grade.
3. Students reprise a previously performed test, launching gummy animals of various "species" and performing a one-way ANOVA test to evaluate whether there is a difference in the mean launch distance of various species.
4. Students compete in the Statistics Olympics, gathering data and performing one-way ANOVA to evaluate whether there is a difference in mean performances among the different grades of students.
5. Students launch stomp rockets, gathering data on various quantifiable variables they select and then construct and interpret a linear model using some or all of the explanatory variables.

Assessments:

Diagnostic: Teacher prepared diagnostic test, Teacher questioning and observation

Formative:

- Past AP Statistics free response questions and rubrics

Summative:

- AP Statistics Examination
- Teacher prepared examination (on post-AP topics)

Correctives:

- practice worksheets
- review assignments and out-of-class review sessions

Materials and Resources:

- AP Statistics textbook, Chapter Review sections of Chapters 1-12
- Fathom
- Practice worksheets, summary sheets
- Past AP Statistics free-response questions
- Graphing calculator

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Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: The Practice of Statistics, 6th Edition

Textbook ISBN #: 1-319-11333-8

Textbook Publisher &Year of Publication: W.H. Freeman, 2018

Curriculum Textbook is utilized in: AP Statistics

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Appendix

AP Statistics Topic Outline

(http://collegeboard.com/student/testing/ap/statistics/topic.html?stats)

The following is an outline of the major topics required by the College Board's AP Statistics program. The College Board does intend the ordering to define the scope of the course but not the sequence. The percentages in parentheses for each area indicate the portion of the exam for that content area.

I. Exploring Data: Describing patterns and departures from patterns (20%-30%)

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

A. Constructing and interpreting graphical displays of distributions of univariate data (dot plot, stem plot, histogram, cumulative frequency plot)
    a. Center and spread
    b. Clusters and gaps
    c. Outliers and other unusual features
    d. Shape
B. Summarizing distributions of univariate data
    a. Measuring center: median, mean
    b. Measuring spread: range, interquartile range, standard deviation
    c. Measuring position: quartiles, percentiles, standardized scores (z-scores)
    d. Using boxplots
    e. The effect of changing units on summary measures
C. Comparing distributions of univariate data (dot plots, back-to-back stem plots, parallel boxplots)
    a. Comparing center and spread: within group, between group variation
    b. Comparing clusters and gaps
    c. Comparing outliers and other unusual features
    d. Comparing shapes
D. Exploring bivariate data
    a. Analyzing patterns in scatterplots
    b. Correlation and linearity
    c. Least-squares regression line
    d. Residual plots, outliers, and influential points
    e. Transformations to achieve linearity: logarithmic and power transformations
E. Exploring categorical data
    a. Frequency tables and bar charts
    b. Marginal and joint frequencies for two-way tables
    c. Conditional relative frequencies and association
    d. Comparing distributions using bar charts

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II. Sampling and Experimentation: Planning and conducting a study (10%-15%)

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

A. Overview of methods of data collection
    a. Census
    b. Sample survey
    c. Experiment
    d. Observational study
B. Planning and conducting surveys
    a. Characteristics of a well-designed and well-conducted survey
    b. Populations, samples, and random selection
    c. Sources of bias in sampling and surveys
    d. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling
C. Planning and conducting experiments
    a. Characteristics of a well-designed and well-conducted experiment
    b. Treatments, control groups, experimental units, random assignments, and replication
    c. Sources of bias and confounding, including placebo effect and blinding
    d. Completely randomized design
    e. Randomized block design, including matched pairs design
D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys

III. Anticipating Patterns: Exploring random phenomena using probability and simulation (20%-30%)

Probability is the tool used for anticipating what the distribution of data should look like under a given model.

A. Probability
    a. Interpreting probability, including long-run relative frequency interpretation
    b. 'Law of Large Numbers' concept
    c. Addition rule, multiplication rule, conditional probability, and independence
    d. Discrete random variables and their probability distributions, including binomial and geometric
    e. Simulation of random behavior and probability distributions
    f. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable
B. Combining independent random variables
    a. Notion of independence versus dependence
    b. Mean and standard deviation for sums and differences of independent random variables
C. The normal distribution
    a. Properties of the normal distribution
    b. Using tables of the normal distribution

   c. The normal distribution as a model for measurements
D. Sampling distributions
   a. Sampling distribution of a sample proportion
   b. Sampling distribution of a sample mean
   c. Central Limit Theorem
   d. Sampling distribution of a difference between two independent sample proportions
   e. Sampling distribution of a difference between two independent sample means
   f. Simulation of sampling distributions
   g. t-distribution
   h. Chi-square distribution

IV. Statistical Inference: Estimating population parameters and testing hypotheses (30%-40%)

Statistical inference guides the selection of appropriate models.

A. Estimation (point estimators and confidence intervals)
   a. Estimating population parameters and margins of error
   b. Properties of point estimators, including bias and variability
   c. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
   d. Large sample confidence interval for a proportion
   e. Large sample confidence interval for a difference between two proportions
   f. Confidence interval for a mean
   g. Confidence interval for a difference between two means (unpaired and paired)
   h. Confidence interval for the slope of a least-squares regression line

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STUDENT ACTIVITIES AND ASSIGNMENTS FROM TEXTBOOK

Chapter 1

Topics	**Instructional Objectives** Students will be able to …	**Assignment**
Chapter 1 Introduction Activity: Can you Smell Parkinsons?	• Identify the individuals and variables in a set of data. • Classify variables as categorical or quantitative.	1, 5, 7, 9, 10
1.1 Bar Graphs and Pie Charts, Graphs: Good and Bad, Analyzing Data on Two Categorical Variables	• Make and interpret bar graphs for categorical data. • Identify what makes some graphs of categorical data misleading. • Calculate marginal and joint relative frequencies from a two-way table.	13, 15, 17, 19, 21, 23
1.1 Relationships Between Two Categorical Variables	• Calculate conditional relative frequencies from a two-way table. • Use bar graphs to compare distributions of categorical data. • Describe the nature of the association between two categorical variables.	27, 29, 33, 35, 40–43
1.2 Dotplots, Stemplots, Histograms, Describing Shape	• Make and interpret dotplots, stemplots, and histograms of quantitative data. • Identify the shape of a distribution from a graph.	45, 49, 51, 59, 63
1.2 Describing Distributions, Comparing Distributions, Using Histograms Wisely	• Describe the overall pattern (shape, center, and variability) of a distribution and identify any major departures from the pattern (outliers). • Compare distributions of quantitative data using dotplots, stemplots, and histograms.	55, 65, 69, 77, 80–85
1.3 Measuring Center: Mean and Median, Comparing the Mean and Median, Measuring Variability: Range, Standard Deviation and *IQR*	• Calculate measures of center (mean, median) for a distribution of quantitative data. • Calculate and interpret measures of variability (range, standard deviation, *IQR*) for a distribution of quantitative data. • Explain how outliers and skewness affect measures of center and variability.	87, 89, 91, 95, 97, 101, 103, 105, 121
1.3 Identifying Outliers, Making and Interpreting Boxplots, Comparing Distributions with Boxplots	• Identify outliers using the $1.5 \times IQR$ rule. • Make and interpret boxplots of quantitative data. • Use boxplots and numerical summaries to compare distributions of quantitative data.	109, 111, 113, 115, 123–126
Chapter 1 Review/FRAPPY!		Chapter 1 Review Exercises
Chapter 1 Test		

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Chapter 2

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
2.1 Measuring Location: Percentiles, Cumulative Relative Frequency Graphs, Measuring Location: *z*-Scores	• Find and interpret the percentile of an individual value within a distribution of data. • Estimate percentiles and individual values using a cumulative relative frequency graph. • Find and interpret the standardized score (*z*-score) of an individual value within a distribution of data.	1, 3, 7, 9, 11, 13, 15, 19
2.1 Transforming Data	• Describe the effect of adding, subtracting, multiplying by, or dividing by a constant on the shape, center, and variability of a distribution of data.	21, 25, 29, 31, 33–38
2.2 Density Curves, Describing Density Curves, Normal Distributions, The 68–95–99.7 Rule	• Use a density curve to model distributions of quantitative data. • Identify the relative locations of the mean and median of a distribution from a density curve. • Use the 68–95–99.7 rule to estimate (i) the proportion of values in a specified interval, or (ii) the value that corresponds to a given percentile in a Normal distribution.	41, 45, 47, 49, 51
2.2 Finding Areas in a Normal Distribution, Working Backward: Finding Values from Areas	• Find the proportion of values in a specified interval in a Normal distribution using Table A or technology. • Find the value that corresponds to a given percentile in a Normal distribution using Table A or technology.	53, 55, 57, 59, 61, 63
2.2 Assessing Normality	• Determine whether a distribution of data is approximately Normal from graphical and numerical evidence.	73, 75, 77, 79, 81, 85–90
Chapter 2 Review/FRAPPY!		Chapter 2 Review Exercises
Chapter 2 Test		

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Chapter 3

Topics	**Instructional Objectives** Students will be able to …	**Assignment**
3.1 Explanatory and Response Variables, Displaying Relationships: Scatterplots, Describing a Scatterplot	• Distinguish between explanatory and response variables for quantitative data. • 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 identify unusual features.	1, 3, 5, 9, 11
3.1 Measuring Linear Association: Correlation, Cautions about Correlation, Calculating Correlation, Additional Facts about Correlation	• Interpret the correlation. • Understand the basic properties of correlation, including how the correlation is influenced by outliers. • Distinguish correlation from causation.	13, 15, 17, 19, 23, 29–34
3.2 Prediction, Residuals, Interpreting a Regression Line	• Make predictions using regression lines, keeping in mind the dangers of extrapolation. • Calculate and interpret a residual. • Interpret the slope and y intercept of a least-squares regression line.	37, 39, 41, 43, 45
3.2 The Least-Squares Regression Line, Determining if a Linear Model is Appropriate: Residual Plots	• Determine the equation of a least-squares regression line using technology or computer output. • Construct and interpret residual plots to assess whether a regression model is appropriate.	47, 49, 51, 53
3.2 How Well the Line Fits the Data: The Role of *s* and r^2 in Regression, Interpreting Computer Regression Output	• 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.	55, 57, 59, 67
3.2 Regression to the Mean, Correlation and Regression Wisdom	• 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.	63, 65, 71–78
Chapter 3 Review/FRAPPY!		Chapter 3 Review Exercises

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Chapter 3 Test		

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Chapter 4

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
4.1 The Idea of a Sample Survey, How to Sample Badly, How to Sample Well: Random Sampling	• Identify the population and sample in a statistical study. • Identify voluntary response sampling and convenience sampling and explain how these sampling methods can lead to bias. • Describe how to select a simple random sample with technology or a table of random digits.	1, 3, 5, 7, 11, 13, 15
4.1 Other Random Sampling Methods	• Describe how to select a sample using stratified random sampling and cluster sampling, distinguish stratified random sampling from cluster sampling, and give an advantage of each method.	17, 19, 21, 22, 23
4.1 Sample Surveys: What Else Can Go Wrong?	• Explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias.	25, 27, 29, 31, 33, 35–40
4.2 Observational Studies Versus Experiments, The Language of Experiments	• Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions. • Distinguish between an observational study and an experiment, and identify the explanatory and response variables in each type of study. • Identify the experimental units and treatments in an experiment.	43, 45, 47, 49, 51, 53
4.2 Designing Experiments: Blinding and the Placebo Effect, Designing Experiments: Random Assignment	• Describe the placebo effect and the purpose of blinding in an experiment. • Describe how to randomly assign treatments in an experiment using slips of paper, technology, or a table of random digits.	57, 59, 61, 63
4.2 Designing Experiments: Comparison, Control, Replication, and Putting It All Together; Completely Randomized Designs	• Explain the purpose of comparison, random assignment, control, and replication in an experiment. • Describe a completely randomized design for an experiment.	55, 65, 67, 69
4.2 Randomized Block Designs	• Describe a randomized block design and a matched pairs design for an experiment and explain the purpose of blocking in an experiment.	71, 75, 77, 79,

		83–90
4.3 Inference for Sampling, Inference for Experiments	• Explain the concept of sampling variability when making an inference about a population and how sample size affects sampling variability. • Explain the meaning of statistically significant in the context of an experiment and use simulation to determine if the results of an experiment are statistically significant.	93, 95, 97, 99
4.3 The Scope of Inference: Putting it All Together, The Challenges of Establishing Causation, Data Ethics (optional)	• Identify when it is appropriate to make an inference about a population and when it is appropriate to make an inference about cause and effect. • Evaluate if a statistical study has been carried out in an ethical manner.	103, 105, 107, 117–118 (109, 111, 113, 115 optional)
Chapter 4 Review/FRAPPY!		Chapter 4 Review Exercises
Chapter 4 Test		Cumulative AP Practice Test 1

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Chapter 5

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
5.1 The Idea of Probability	• Interpret probability as a long-run relative frequency.	1, 3, 5, 7
5.1 Simulation	• Use simulation to model chance behavior.	9, 11, 15, 21, 23–28
5.2 Probability Models, Basic Probability Rules	• Give a probability model for a chance process with equally likely outcomes and use it to find the probability of an event. • Use basic probability rules, including the complement rule and the addition rule for mutually exclusive events.	31, 33, 35, 37, 39
5.2 Two-Way Tables, Probability, and the General Addition Rule, Venn Diagrams and Probability	• Use a two-way table or Venn diagram to model a chance process and calculate probabilities involving two events. • Apply the general addition rule to calculate probabilities.	41, 47, 49, 51, 53, 55–58
5.3 What Is Conditional Probability?, Conditional Probability and Independence, The General Multiplication Rule	• Calculate and interpret conditional probabilities. • Determine whether two events are independent. • Use the general multiplication rule to calculate probabilities.	61, 63, 65, 67, 69, 71, 77, 79
5.3 Tree Diagrams and Conditional Probability, The Multiplication Rule for Independent Events	• Use a tree diagram to model a chance process involving a sequence of outcomes and to find probabilities. • When appropriate, use the multiplication rule for independent events to calculate probabilities.	81, 83, 87, 89, 91, 93, 99, 103–106
Chapter 5 Review/FRAPPY!		Chapter 5 Review Exercises
Chapter 5 Test		

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Chapter 6

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
6.1 Discrete Random Variables, Analyzing Discrete Random Variables: Describing Shape, Measuring Center: The Mean (Expected Value) of a Discrete Random Variable	• Use the probability distribution of a discrete random variable to calculate the probability of an event. • Make a histogram to display the probability distribution of a discrete random variable and describe its shape. • Calculate and interpret the mean (expected value) of a discrete random variable.	1, 3, 5, 7, 9, 11
6.1 Measuring Variability: The Standard Deviation (and Variance) of a Discrete Random Variable, Continuous Random Variables	• Calculate and interpret the standard deviation of a discrete random variable. • Use the probability distribution of a continuous random variable (uniform or Normal) to calculate the probability of an event.	13, 19, 21, 23, 27, 29, 31–34
6.2 Transforming a Random Variable	• Describe the effect of adding or subtracting a constant or multiplying or dividing by a constant on the probability distribution of a random variable.	37, 39, 41, 43, 47
6.2 Combining Random Variables, Standard Deviation of the Sum or Difference of Two Random Variables, Combining Normal Random Variables	• Calculate the mean and standard deviation of the sum or difference of random variables. • Find probabilities involving the sum or difference of independent Normal random variables.	49, 51, 55, 57, 59, 65, 67, 73–74
6.3 Binomial Settings and Binomial Random Variables, Calculating Binomial Probabilities	• Determine whether the conditions for a binomial setting are met. • Calculate and interpret probabilities involving binomial distributions.	77, 79, 81, 83, 85, 89
6.3 Describing a Binomial Distribution: Shape, Center, and Variability; Binomial Distributions in Statistical Sampling, The Normal Approximation to Binomial Distributions (optional)	• Calculate the mean and standard deviation of a binomial random variable. Interpret these values in context. • When appropriate, use the Normal approximation to the binomial distribution to calculate probabilities.	91, 93, 95, 99, 101, 105 (103, 106, 117 optional)

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6.3 Geometric Random Variables	• Find probabilities involving geometric random variables.	107, 109, 111 113–116
Chapter 6 Review/FRAPPY!		Chapter 6 Review Exercises
Chapter 6 Test		

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Chapter 7

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
7.1 Parameters and Statistics, The Idea of a Sampling Distribution	• Distinguish between a parameter and a statistic. • Create a sampling distribution using all possible samples from a small population.	1, 3, 5, 7, 9
7.1 The Idea of a Sampling Distribution, Describing Sampling Distributions	• Use the sampling distribution of a statistic to evaluate a claim about a parameter. • Distinguish among the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic. • Determine if a statistic is an unbiased estimator of a population parameter. • Describe the relationship between sample size and the variability of a statistic.	11, 13, 15, 19, 21, 25, 26–30
7.2 The Sampling Distribution of $\hat{p}$, Using the Normal Approximation for $\hat{p}$.	• Calculate the mean and standard deviation of the sampling distribution of a sample proportion $\hat{p}$ and interpret the standard deviation. • Determine if the sampling distribution of $\hat{p}$ is approximately Normal. • If appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$.	35, 37, 41, 43, 47–50
7.3 The Sampling Distribution of $\overline{x}$, Sampling from a Normal Population	• Calculate the mean and standard deviation of the sampling distribution of a sample mean $\overline{x}$ and interpret the standard deviation. • Explain how the shape of the sampling distribution of $\overline{x}$ is affected by the shape of the population distribution and the sample size. • If appropriate, use a Normal distribution to calculate probabilities involving $\overline{x}$.	53, 55, 57, 61
7.3 The Central Limit Theorem	• Explain how the shape of the sampling distribution of $\overline{x}$ is affected by the shape of the population distribution and the sample size. • If appropriate, use a Normal distribution to calculate probabilities involving $\overline{x}$.	63, 65, 67, 69, 71, 73–76
Chapter 7 Review/FRAPPY!		Chapter 7 Review Exercises
Chapter 7 Test		Cumulative AP® Practice Exam 2

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Chapter 8

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
Chapter 8 Introduction, 8.1 The Idea of a Confidence Interval, Interpreting Confidence Intervals	• Identify an appropriate point estimator and calculate the value of a point estimate. • Interpret a confidence interval in context. • Determine the point estimate and margin of error from a confidence interval. • Use a confidence interval to make a decision about the value of a parameter.	1, 3, 5, 7, 9
8.1 Interpreting Confidence Level, What Affects the Margin of Error?	• Interpret a confidence level in context. • Describe how the sample size and confidence level affect the margin of error. • Explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval.	11, 15, 17, 19, 21, 23-26
8.2 Constructing a Confidence Interval for *p*	• State and check the Random, 10%, and Large Counts conditions for constructing a confidence interval for a population proportion. • Determine the critical value for calculating a *C*% confidence interval for a population proportion using a table or technology.	29, 31, 35, 37, 39
8.2 Putting It All Together: The Four-Step Process, Choosing the Sample Size	• 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.	41, 45, 49, 55-58
8.3 The Problem of unknown σ, Conditions for Estimating μ	• Determine the critical value 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.	61, 63, 65, 67
8.3 Constructing a Confidence Interval for μ, Choosing the Sample Size	• 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.	69, 73, 77, 81-84
Chapter 8 Review/FRAPPY!		Chapter 8 Review Exercises
Chapter 8 Test		

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Chapter 9

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
Chapter 9 Introduction; 9.1 Stating Hypotheses, Interpreting *P*-values, Making Conclusions	• State appropriate hypotheses for a significance test about a population parameter. • Interpret a *P*-value in context. • Make an appropriate conclusion for a significance test.	1, 3, 5, 7, 9, 13, 14, 15, 19
9.1 Type I and Type II Errors	• Interpret a Type I and a Type II error in context. Give a consequence of each error in a given setting.	21, 23, 25, 27, 29-32
9.2 Performing a Significance Test About *p*	• State and check the Random, 10%, and Large Counts conditions for performing a significance test about a population proportion. • Calculate the standardized test statistic and *P*-value for a test about a population proportion.	35, 37, 39, 41
9.2 Putting It All Together: One-Sample *z* Test for *p*, Two-Side Tests	• Perform a significance test about a population proportion.	43, 45, 47, 51, 53, 55, 59-62
9.3 Carrying Out a Significance Test for μ , Putting It All Together: One-Sample *t* Test for μ	• State and check the Random, 10%, and Normal/Large Sample conditions for performing a significance test about a population mean. • Calculate the standardized test statistic and *P*-value for a test about a population mean. • Perform a significance test about a population mean.	65, 67, 69, 73, 77, 79
9.3 Two-Sided Tests and Confidence Intervals, The Power of a Test, Using Tests Wisely	• Use a confidence interval to make a conclusion for a two-sided test about a population parameter. • Interpret the power of a significance test and describe what factors affect the power of a test.	81, 85, 87, 93, 95, 97, 102-108
Chapter 9 Review/FRAPPY!		Chapter 9 Review Exercises
Chapter 9 Test		

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Chapter 10

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
"Who Likes Tattoos?" Activity, 10.1 The Sampling Distribution of a Difference between Two Proportions	• Describe the shape, center, and variability of the sampling distribution of $\hat{p}_1 - \hat{p}_2$.	1, 3
10.1 Confidence Intervals for $p_1 - p_2$	• Determine whether the conditions are met for doing about a difference between two proportions. • Construct and interpret a confidence interval for a difference between two proportions.	5, 7, 9, 11, 13
10.1 Significance Tests for $p_1 - p_2$, Putting It All Together: Two-sample *z* Test for $p_1 - p_2$.	• Calculate the standardized test statistic and *P*-value for a test about a difference between two proportions. • Perform a significance test about a difference between two proportions.	15, 19, 21, 29 31-33
10.2 The Sampling Distribution of a Difference between Two Means, Confidence Intervals for $\mu_1 - \mu_2$	• Describe the shape, center, and variability of the sampling distribution of $\overline{x}_1 - \overline{x}_2$. • Determine whether the conditions are met for doing inference about a difference between two means. • Construct and interpret a confidence interval for a difference between two means.	37, 39, 41, 45, 49
10.2 Significance Tests for $\mu_1 - \mu_2$, Putting It All Together: Two-sample *t* Test for $\mu_1 - \mu_2$.	• Calculate the standardized test statistic and *P*-value for a test about a difference between two means. • Perform a significance test for the difference between two means.	51, 53, 55, 57, 67, 69-72
10.3 Analyzing Paired Data, Confidence Intervals for μ_{diff}. Significance tests for μ_{diff}. Paired Data or Two Samples?	• Analyze the distribution of differences in a paired data set using graphs and summary statistics. • Construct and interpret a confidence interval for a mean difference. • Perform a significance test about a mean difference.	75, 79, 85
10.3 "Get Your Heart Beating! Activity, Paired Data or Two Samples?	• Determine when it is appropriate to use paired *t* procedures versus two-sample *t* procedures.	91, 93, 95-97

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Chapter 10 Review/ FRAPPY!		Chapter 10 Review Exercises
Chapter 10 Test		Cumulative AP® Practice Exam 3

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Chapter 11

Topics	**Instructional Objectives** Students will be able to…	**Assignment**
Activity: The Candy Man Can; 11.1 Stating Hypotheses; Comparing Observed and Expected Counts: The Chi-Square Statistic; The Chi-Square Distributions and *P*-values	• State appropriate hypotheses and compute the expected counts and chi-square statistic 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.	1, 3, 5, 7
11.1 Carrying Out a Test; Follow-Up Analysis	• State and check the Random, 10%, and Large Counts conditions for performing 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.	9, 13, 19-21
11.2 Tests for Homogeneity: Stating Hypotheses, Expected Counts and the Chi-Square Test Statistic, Conditions and *P*-values; The Chi-Square Test for Homogeneity	• State appropriate hypotheses and compute the expected counts and chi-square test statistic for a chi-square test based on data in a two-way table. • State and check the Random, 10%, and Large Counts conditions for a chi-square test based on data in a two-way table. • Calculate the 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.	27, 29, 31, 33, 35
11.2 Relationships Between Two Categorical Variables; The Chi-Square Test for Independence; Using Chi-Square Tests Wisely	• Perform a chi-square test for independence. • Choose the appropriate chi-square test in a given setting.	41, 43, 47, 49, 51, 55-60
Chapter 11 Review/ FRAPPY!		Chapter 11 Review Exercises
Chapter 11 Test		

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Chapter 12

Topics	**Instructional Objectives** Students will be able to …	**Assignment**
Activity: Sampling from Old Faithful; 12.1 Sampling Distribution of b_1; Conditions for Regression Inference	• Check the conditions for performing inference about the slope b_1 of the population (true) regression line.	1, 3, 5
12.1 Estimating the Parameters; Constructing a Confidence Interval for the Slope	• Interpret the values of b_0, b_1, s, and SE_{b_1} in context, and determine these values from computer output. • Construct and interpret a confidence interval for the slope b_1 of the population (true) regression line.	7, 9, 11
12.1 Performing a Significance Test for the Slope	• Perform a significance test about the slope b_1 of the population (true) regression line.	15, 23-28
12.2 Transforming with Powers and Roots; Transforming with Logarithms: 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. • Use transformations involving logarithms to find a power model that describes the relationship between two quantitative variables, and use the model to make predictions.	33, 35, 37, 39
12.2 Transforming with Logarithms: Exponential Models; Putting it all Together: Which Transformation Should We Choose?	• Use transformations involving logarithms to find an exponential model that describes the relationship between two quantitative variables, and use the model to make predictions. • Determine which of several transformations does a better job of producing a linear relationship.	43, 45, 47, 51-54
Chapter 12 Review/ FRAPPY!		Chapter 12 Review Exercises
Chapter 12 Test		Cumulative AP® Practice Test 4

DELAWARE VALLEY SCHOOL DISTRICT

AP Statistics Exam Preparation Unit

Topics	**Instructional Objectives** Students will be able to …	**Assignment**
Activity: Identifying Inference Procedures applying to various scenarios, using http://www.ltcconline.net/greenl/java/Statistics/catStatProb/categorizingStatProblems.html	• Identify Inference Procedures for various scenarios.	Name That Test online form, https://goo.gl/forms/IPFqYy2JBl3u78hg1
Activity: Simulated AP Statistics Exams, 2002, 2007, 2012	• Complete AP Statistics multiple choice and free response sections, using exam item reading skills, and apply rubrics to scoring free response questions; apply AP Statistics formulae to identify AP exam score	2002, 2007, 2012 AP Statistics exams, taking exams and scoring
Activity: An AP Statistics Mystery	• Identify various AP Statistics topics in mixed problem solving and critical reasoning activities	Complete six statistical challenges to get clues to solve the mystery.

DELAWARE VALLEY SCHOOL DISTRICT

Checklist to Complete and Submit with Curriculum:

_____ **A hard copy of the curriculum using the template entitled "Planned Instruction," available on the district website**

_____ **Hard copies of all supplemental resources not available electronically**

_____ **The primary textbook form(s)**

_____ **The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document**

_____ **A USB/Flash Drive containing a single file that will print the curriculum in its intended sequence from beginning to end and all supplemental resources that are available in electronic format.**

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Printed Name_____

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____