http://www.collegeboard.com/html/apcourseaudit/pdf/AP\_Course\_Audit\_Calendar.pdf

Course Title: Advanced Placement Statistics

Meeting Times: This course runs for 40 weeks and meets two or three times a week for 85 minutes.

Course Description:

AP Statistics provides a systematic development of the concepts, principles, and tools of statistics with an emphasis on inquiry and critical-thinking skills associated with the collection, representation, analysis, and drawing conclusions from authentic data. Topics of study include data investigation, designing and conducting studies, anticipating patterns using probability and simulations, and statistical inference. Technology is a central component of the course and includes the use of graphing calculators, computers, and data analysis software. On a regular basis, graphing calculators and computers are used to explore, discover, and reinforce concepts of statistics and probability.

Though our system has an open enrollment policy, students should understand that this course is designed to be a fourth-year mathematics course, and the equivalent of an introductory, one, semester, non-calculus-based, college-level statistics course. The course requires a working knowledge of Algebra II and quantitative reasoning. The breadth, pace, and depth of material covered exceeds the standard high school mathematics course, as does the college-level textbook, and time and effort required of students. This course provides the statistics foundation for college majors in social sciences, health sciences, and business, and serves as the preparation for an upper-level, calculus-based statistics course for majors in the sciences, engineering, and mathematics. Students are expected to take the AP Statistics Exam at the end of this course.

Course Purpose and Goals:

Philosophy

Understanding statistics as the science of data is the basis of this course. Statistics is the formal study of data as numbers in context. Students build an understanding of statistical concepts as they construct relationships and make connections among the various representations of data and how data is interpreted. The course is more than a collection of topics; it is a coherent, focused curriculum that develops a broad range of statistical and probabilistic thinking, and variety of statistical methods and applications. Although the development of techniques and fluency with graphic and numeric representations to represent problems is important, it is not the only focus of the course. Rather, the course emphasizes a conceptual development of statistical thinking through the use of an exploratory analysis of real data often using technology, planning and implementing well-designed studies, and engaging students in active learning. According to the National Council of Teachers of Mathematics (2000), “The amount of data available to help make decisions in business, politics, research, and everyday life is staggering…Statistics are often misused to sway public opinion on issues or to misrepresent the quality and effectiveness of commercial products. Students need to know about data analysis and related aspects of probability in order to reason statistically with skills necessary to becoming informed citizens and intelligent consumers” (p. 48).

To support students’ development of statistical thinking, technology is used to enhance their understanding of major concepts and tools for working with data. The College Board requires the use of graphing calculators for this course. Mathematical problem solving, investigations, and projects require adequate and timely access to technology including graphing calculators, databases, spread sheets, Internet and on-line resources, and data analysis software packages. In this course, technology is introduced in the context of real-world problems, incorporating multiple graphical representations, uses a simulation approach for studying probability, and facilitates connections to other disciplines. Students actively participate in the process of statistical investigations by using estimation, mental math, calculators, computers, and paper-and-pencil techniques.

The standards support the unifying themes of exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Instruction is designed and sequenced to provide students with learning opportunities in appropriate settings. Teaching strategies include collaborative small-group work, pairs engaged in data analysis, whole-group presentations, peer-to-peer discussions, and an integration of technology when appropriate. In this course, students are often actively engaged in statistical investigations that enable them to collaborate with peers in fitting mathematical models to the data and interpreting how well the model fits the data. It is a cyclic process in which the data suggest refinements in original questions and mathematical models used. Based on the data, relationships among variable are evaluated through appropriate methods of analysis. Students are encouraged to discuss the mathematics of statistical analysis and inferences, to use the language and tools of statistics to communicate, and to discuss problems and methods of solution.

Goals

*Students should be able to:*

1. Develop statistical thinking based on a conceptual understanding of major topics and tools of data collection, representation, analysis, inference, and conclusions.
2. Analyze and interpret data from graphical displays and numerical distribution summaries, and justify conclusions.
3. Employ the language and symbols of statistics, and effectively communicate the formulation of questions, data collection methods and displays, interpretation of statistical analysis, and evaluation of inferences and predictions based on the data.
4. Use probability as a tool to predict how the distribution of data is related to an appropriate mathematical model.
5. Develop and understanding of statistical inference through the use of confidence intervals and test of significance.
6. Use graphing calculators and computers in the exploration, statistical analysis, simulation and modeling of data.
7. Make sense of and evaluate the reasonableness of conclusions based on data.
8. Develop an appreciation for an historical perspective of statistics.

Conceptual Organization

The content and level of depth of the material for this course is equivalent to a college-level course. The course content is organized to emphasize major topics in the course to include the following: (1) exploring data, (2) sampling and experimentation, (3) anticipating patterns, and (4) statistical inference. Building on most students’ prior knowledge, the course begins with a review of graphical and numerical data displays. Technology enhances students’ constructing and understanding of mathematical relationships among these different representations used in solving problems. This supports and leads to students’ visualization and discussion of distribution summaries including measure of center, spread, and position. Information from distributions of univariate data are compared and interpreted in the context of real-world problems. Normal distributions are examined prior to moving to the study of bivariate data.

Students are provided with opportunities to generate and collect bivariate data, and they analyze relationships between variables using scatter plots, linear correlations, and least square regression lines. Outliers, influential points, residual plots, and transformations to achieve linearity are examined. This is followed with a focus on the concept of cause and effect, confounding variables, and relationships found in categorical data. In quarter 2, students investigate the purpose and process of a statistical investigation. The concept of randomness is studied and a variety of data collection methods that are used to support the design of a well-planned study. This naturally leads to an examination of sampling error and sources of bias. Probability is introduced as a method for exploring random phenomena, used to analyze simulations, and viewed as predictable patterns in sampling distributions. Specifically, students begin to work with binomial and geometric distributions and probabilities near the end of the first semester.

During the second semester of the course, students broaden their understanding of statistical concepts and techniques to include more sampling distributions, the Central Limit Theorem, and statistical inference. Confidence intervals and tests of significance are emphasized through a wide-range of appropriate models dependent upon the conditions of particular real-world problems. After the AP exam, students will extend the material to multivariable regression and additional topics on non-parametric inference techniques. This order of topics within the course, not only provides logical and systemic study to statistics, but also accommodates the frequent transfer of students with the schools of the system, so that transfer students can maintain a consistent flow of learning.

Course Format and Policies:

In order to provide the most time for discussion and exploration of the major themes of the course, the students are expected to read each unit pro to classroom discussion. This allows the discussion to focus on topics that are more difficult to understand. This should make the course appropriate to a wider range of students since it will allow more time in class on the most confounding ideas. The expectation is that students are highly committed and of high character.

The intention to make the course available to the broadest range of students has resulted in a policy that allows retesting within the quarter on any topic in which the student is unsuccessful. Students are expected to continue to strive until they have reached a level of understanding commensurate with the need for future units in the course. The focus of grading is to recognize where they are in their learning, rather than how long it took to get there.

Weighted grades are calculated for students completing and taking the requisite exam of an AP course.

Unweighted Scale A=4 Weighted Scale A=5

Unweighted Scale B=3 Weighted Scale B=4

Unweighted Scale C=2 Weighted Scale C=3

Unweighted Scale D=1 Weighted Scale D=2

Unweighted Scale F=0 Weighted Scale F=0

Textbooks, Materials and Other Resources: Required Textbook

* Bock, D. E., Velleman, P. F., and De Veaux, R.D.(2010). *Stats Modeling the World,* 3rd Edition, Boston: Addison-Wesley, Pearson Education, Inc.

Supplemental Textbooks and Readings

* Tabor, J., Yates, D.S., Moore, D.S., and Starnes, D.S. (2010). *The Practice of Statistics,* 3rd Edition, New York: W. H. Freeman and Company.
* Selected AP Statistics Exam free-response questions are used throughout the course

Other Resources

* Fathom Dynamic Statistics Software, Key curriculum Press.
* Computers. All students have access to computers in school library and math classroom during seminar and lunch.
* Software,.
  + Fathom Dynamic Statistics Software, Key curriculum Press.
  + StatCrunch V4.0 internet software through LancerStats
  + WinStats, Peanut Software, R Parris
* Graphing calculators. Texas Instruments TI-84+ calculator
* Other resource materials used in the classroom come from articles in newspapers, journals, and the World Wide Web. Students often bring in data sets they collect or download from the Web.

Course Content Outline:

Unit 1 – Exploring and Understanding Data (25 Days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 1 day | *Chapter 1 – Stats Starts Here*  Topics covered:   * Introduction to Statistics, Data, and Variation.   Assignments:   * Read: Read Chapter 1 pgs 2-5 * Complete Chapter 1 Reading Guide |  |
| 2 days | *Chapter 2 – Data*  Topics covered:   * Analyzing Data – Who, What, When, Where, Why, How * Categorical vs. Quantitative Variables * TI: Entering data and working with data lists   Assignments:   * Read Chapter 2 pgs 6-12 * Complete Chapter 2 Reading Guide * Pg 13-14 #5, 7, 8, 9, 12, 16 |  |
| 3 days | *Chapter 3 – Displaying and Describing Categorical Data*  Topics covered:   * Frequency and Relative Frequency Tables * Distributions of Categorical Variables * Importance of the Area Principle * Bar and Pie Charts * Contingency Tables * Marginal and Conditional Distributions * Independence of Categorical Variables * Segmented Bar Charts * Simpson’s Paradox   Project:   * Analyzing Bad Graphs - Find a graph in a newspaper, magazine, or on the internet that is an example of a violation of the area principle. Explain how the graph is misleading and what should be changed to improve it.   Assignments:   * Read Chapter 3 pgs 15-28 * Complete Chapter 3 Reading Guide * Pg 28-35 #6, 7, 12, 14, 16, 22, 23, 29, 30 | I. Exploring Data  E. Exploring categorical data  1.Frequency tables and bar charts  2.Marginal and joint frequencies for two-way table  3.Conditional relative frequencies and association  4.Comparing distributions using bar charts |
|  | *Chapter 4 – Displaying Quantitative Data*  Topics covered:   * Distributions of Quantitative Variables * Frequency and Relative Frequency Histograms * Stem-and-Leaf Displays * Dotplots * Describing a Distribution in terms of shape, outliers, center, and spread (SOCS) * Shape: Modality, Uniformity, Symmetry, Skewness, Unusual Observations, Gaps, and Clusters * Center and Spread in General Terms * Comparing Distributions * Time plots * TI: Creating a Histogram   Applets:   * Effects of Bin Width on Histograms   Assignments:   * Read Chapter 4 pgs 36-49 * Complete Chapter 4 Reading Guide * Pg 50-56 #4, 6, 7, 10, 12, 14, 17, 28, 30, 32 | I. Exploring Data  A. Constructing and interpreting graphical displays of distributions of univariate data (boxplot, stemplot, histogram, cumulative frequency plot)  1.Center and spread  2.Clusters and gaps  3.Outliers and other unusual features  4.Shape  C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)  1.Comparing center and spread within group, between group variation  2.Comparing clusters and gaps  3.Comparing outliers and other unusual features  4.Comparing shapes |
| 5 days | *Chapter 5 – Summary Statistics*  Topics covered:   * Measures of Central Tendency (Mean, Median, Mode, and Midrange) * Measures of Spread (Range, IQR, Variance, Standard Deviation) * Five Number Summary * Quartiles/Percentiles * Calculating Outlier “Fences” * Boxplots * Comparing Multiple Datasets * Resistance vs. Non-resistance to Extreme Values * Cumulative Frequency Graphs * TI: Creating a Boxplot, Finding the Five Number Summary, Calculating the Mean and Standard Deviation   Lab Activity:   * The Game of Greed Lab – Students gather data by playing the “Game of Greed”, then analyze the data using back-to-back stemplots, modified boxplots, and summary statistics to compare male and female scores.   Project:   * Auto Safety Investigative Task – Students analyze and compare auto safety records among small, mid-size, and large vehicles using graphical and numerical measures in order to draw a conclusion concerning insurance policies.   Assignments:   * Read Chapter 5 pgs 57-72 * Complete Chapter 5 Reading Guide * Pg 73-82 #5, 7, 8, 11, 12, 15, 16, 19, 20, 21, 24, 26, 29, 31, 32, 35 | I. Exploring Data  A. Constructing and interpreting graphical displays of distributions of univariate data (boxplot, stemplot, histogram, cumulative frequency plot)  1.Center and spread  2.Clusters and gaps  3.Outliers and other unusual features  4.Shape  B. Summarizing distributions of univariate data  1.Measuring center: median and mean  2.Measuring spread: range,  Interquartile range, standard deviation  3.Measuring position: quartiles, percentiles, standardized scores (z-scores)  4.Using boxplots  C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)  1.Comparing center and spread within group, between group variation  2.Comparing clusters and gaps  3.Comparing outliers and other unusual features  4.Comparing shapes |
| 6 days | *Chapter 6 – The Standard Deviation as a Ruler and the Normal Model*  Topics covered:   * Introduction to Standardized Scores (z-scores) * Shifting Data by Adding or Subtracting a Constant Value * Rescaling Data by Multiplying or Dividing by a Constant Value * Normal Models * Parameters vs. Statistics * Standard Normal Model * Empirical Rule (68-95-99.7 Rule) * Tables of Normal percentiles to calculate probabilities for a Normal Model and to find z-scores for a given percentile. * Assessing Normality * Normal Probability Plots * TI: Finding Normal Probabilities, Finding z-scores for a given percentile, Creating a Normal Probability Plot   Assignments:   * Read Chapter 6 pgs 83-99 * Complete Chapter 6 Reading Guide * Pg 100-103 #2, 3, 7, 12, 13, 15, 16, 20, 22, 24, 26, 27, 28, 29, 31 | I. Exploring Data  B. Summarizing distributions of univariate data  3 .Measuring position: quartiles, percentiles, standardized scores (z-scores)  5.The effect of changing units on summary measures  III. Anticipating Patterns  C. The normal distribution  1.Properties of the normal distribution  2.Using tables of the normal distribution  3.The normal distribution as a model for measurements |
| 5 days | *Unit Assessments*   * Quiz – Chapter 2/3 * Quiz – Chapter 4/5 * Unit 1 Review * Unit 1 Multiple Choice Test * Unit 1 Free Response Test |  |

Unit 2A – Exploring Relationships Between Variables (11 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 2 days | *Chapter 7 – Scatter plots, Association, and Correlation*  Topics covered:   * Introduction to Bivariate Data * Creating a Scatter plot * Describing a Scatter plot in terms of Direction, Form, Strength, and Unusual Observations * Explanatory vs. Response Variables * Calculating Correlation * Conditions Required for Correlation * Properties for Correlation * Correlation Tables * Correlation vs. Association * Lurking Variables and Causation * TI: Creating a Scatter plot, Calculating Correlation   Applets:   * Visualizing Strength and Direction with Correlation <http://noppa5.pc.helsinki.fi/koe/corr/cor7.html> * Guess the Correlation Game <http://www.stat.uiuc.edu/courses/stat100/java/>GCApplet/GCAppletFrame.html   Assignments:   * Read Chapter 7 pgs 115-131 * Complete Chapter 7 Reading Guide * Pg 131-136 #1, 5, 6, 10, 11, 12, 14, 18, 20, 23 | I. Exploring Data  D. Exploring bivariate data  1.Analyzing patterns in scatter plots  2.Correlation and linearity |
| 5 days | *Chapter 8 – Linear Regression*  Topics covered:   * Linear Models * Predicted Values * Line of Best Fit * Regression to the Mean * Least Squares Regression Line (LSRL) * Finding the Slope and Y-intercept of the LSRL using Summary Statistics * Interpreting the Slope and Y-Intercept of the LSRL * Calculating and Interpreting Residual Values * Creating and Interpreting a Residual Plot * Understanding and Interpreting the Coefficient of Determination * Assumptions and Conditions for the Linear Regression Model * Reading Computer Output for Regression * TI: Finding the LSRL, Adding a Line to a Graph of Datapoints, Creating a Residual Plot   Lab Activities:   * Pinching Pages Lab – Students will gather data on number of pages vs. thickness by “pinching” the pages of their textbook in order to develop the idea behind finding a line of best fit (LSRL), and interpreting the slope and intercept of a bivariate dataset. * Height vs. Hand Width Lab – Students will gather data about the class heights and hand widths in order to analyze and interpret the data as a review of the chapter’s content. * Importance of Graphing Data – Students will explore ‘Anscombe Data Sets’ to see why you should never trust summary data without a graph.   Applets:   * Meaning of “Least Squares” [http://standards.nctm.org/document/eexamples /chap7/7.4/standalone1.htm](http://standards.nctm.org/document/eexamples%20/chap7/7.4/standalone1.htm) * Understanding the Slope of the LSRL   <http://www.bbn-school.org/us/math/ap_stats/>  investigations\_folder/powerpoint\_folder/  understanding\_rSySx.pps   * Understanding r-squared <http://www.bbn-school.org/us/math/ap_stats/>   investigations\_folder/powerpoint\_folder/  understanding\_r-sq\_.pps  Assignments:   * Read Chapter 8 pgs 137-154 * Complete Chapter 8 Reading Guide * Pg 154-161 #2, 3, 7, 8, 9, 10, 17, 18, 22, 25, 26, 31, 32, 35 | I. Exploring Data  D. Exploring bivariate data  1.Analyzing patterns in scatter plots  2.Correlation and linearity  3.Least-squares regression lines  4.Residual plots, outliers, and influential points |
| 4 days | *Unit Assessments*   * Quiz – Chapter 7 * Unit 2A Review * Unit 2A Multiple Choice Test * Unit 2A Free Response Test |  |

Unit 2B – Exploring Relationships Between Variables (8 Days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 2 days | *Chapter 9 – Regression Wisdom*  Topics covered:   * Abuses of Regression * Exploring Subsets of Data * Non-linear datasets * Dangers of Extrapolation * Examining Outliers in Regression Models * Lurking Variables and Causation * Working with Summary Values   Articles:   * Women may outsprint men by 2156 – Article illustrating extrapolation in the news <http://news.bbc.co.uk/1/hi/uk/3702650.stm>   Applet:   * Exploring Linear Regression <http://bcs.whfreeman.com/yates/cat_020/>   applets/CorrelationRegression.html  Assignments:   * Read Chapter 9 pgs 162-175 * Complete Chapter 9 Reading Guide * Pg 175-180 #2, 9, 10, 12, 13, 19, 20 | I. Exploring Data  D.. Exploring bivariate data  1. Least-squares regression lines  2. Residual plots, outliers, and influential points |
| 4 days | *Chapter 10 – Re-expressing Data: It’s Easier Than You Think*  Topics covered:   * Linear vs. Non-linear growth * Re-expressing data sets * Using the Ladder of Powers * Using logarithms to straighten scatter plots, including the Exponential, Logarithmic, and Power models. * TI: Using logarithms to re-express data, Creating residual plots   Lab Activity:   * Growth and Decay of M&Ms – Students will gather data for the exponential growth and decay of M&Ms candies, then analyze the data using logarithms to re-express the data in linear form.   Project:   * Save Fluffy! Investigative Task – Students will analyze non-linear bivariate data regarding the length and weights of alligators in order to make the best prediction of weight for an alligator of 96 inches in length. Students must also weigh the pros and cons of possible influential outliers.   Assignments:   * Read Chapter 10 pgs 181-198 * Complete Chapter 10 Reading Guide * Pg 198-202 #1, 2, 4, 6, 7, 8, 27 | I. Exploring Data  D. Exploring bivariate data  3. Least-squares regression lines  4.Residual plots, outliers, and influential points  5. Transformations to achieve linearity: logarithmic and power transformations |
| 2 days | *Unit Assessments*   * Unit 2B Review * Unit 2B Test |  |

Unit 3 – Gathering Data (18 Days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 3 days | *Chapter 11 – Understanding Randomness*  Topics covered:   * Understanding the Concept of Randomness * How the Mind is Not Random * Pseudorandom Numbers * Tables of Random Digits * Conducting a Simulation * Components of a Simulation (outcomes, trials, response variables) * TI: Seeding the Random Number Generator, Generating Random Numbers   Lab Activity:   * Streaky Behavior Lab – Students will explore real randomness vs. perceived randomness by examining coin flips to determine the length of a “streak” of heads in a real coin flip sequence.   Video:   * Numb3rs Episode 101 video clip – Charlie discusses how the human mind tries to simulate randomness and instead creates a pattern by being too evenly spaced.   Project:   * Simulation Project – Students will create their own scenario that can be modeled by a probability simulation and present their problem and solution in poster format.   Assignments:   * Read Chapter 11 pgs 215-223 * Complete Chapter 1 Reading Guide * Pg 223-225 #9, 10, 11, 12, 13, 14, 15, 16, 18 | III. Anticipating Patterns  A. Probability  1. Simulation of random behavior and probability distributions |
| 4 days | *Chapter 12 –Sample Surveys*  Topics covered:   * Sample Statistics vs. Population Parameters * The Good and the Bad of Polling * Why Randomization is Important in Sampling * How Sample Size Plays a Role in Sampling * Taking a Census * Sampling Frame * Sampling Variability * Statistical Sampling Methods: Simple Random Sampling, Stratified Random Sampling, Cluster Sampling, Multistage Sampling, Systematic Sampling * Nonstatistical Sampling Methods – Voluntary Response Sampling, Convenience Sampling * Bias in Sampling – Voluntary Response Bias, Sampling from a Bad Sampling Frame, Undercoverage, Overcoverage, Nonresponse Bias, Response Bias, Poorly Worded Questions   Lab Activity:   * How Many G’s – Students will explore the accuracy of the census by counting the number of G’s in a short story in a specified time limit. Students will then recount the number of G’s using a statistical sampling method in order to compare the results. * JellyBlubbers – Students will attempt to estimate the average length of the JellyBlubber colony using a variety of sampling methods in order to compare the accuracy of the methods.   Article:   * How Polls are Conducted by Gallup <http://media.gallup.com/PDF/FAQ/HowArePolls.pdf>   Assignments:   * Read Chapter 12 pgs 226-242 * Complete Chapter 12 Reading Guide * Pg 243-245 #1, 3, 8, 11, 12, 13, 14, 18, 20, 23, 24 | II. Sampling and Experimentation:  Planning and conducting a study  A. Overview of methods of data collection  1.Census  2.Sample survey  B. Planning and conducting surveys  1.Characteristics of a well- designed and well-conducted survey  2.Populations, samples, and random selection  3.Sources of bias in sampling and surveys  4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling.  D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys |
| 6 days | *Chapter 13 – Experiments*  Topics covered:   * Observational Studies vs. Experiments * Types of Observational Studies – Retrospective vs. Prospective * Elements of an Experiment * Experimental Units, Subjects, and Participants * Explanatory Variables, Factors, Levels, and Treatments * Response Variables * Principles of Experimental Design (Control, Randomization, Replication, and Blocking) * Completely Randomized Experimental Designs * Idea of Statistical Significance * Control Treatments and Control Groups * Blinding (Single and Double Blind) * Placebo and Placebo Effect * Randomized Block Experimental Designs * Matched Pairs Designs * Idea of Confounded Variables   Project:   * Experimental Design Task – Students will locate an article describing an experimental study, and then answer several questions concerning the study.   Assignments:   * Read Chapter 13 pgs 246-262 * Complete Chapter 13 Reading Guide * Pg 262-266 #6, 7, 8, 10, 21, 22, 23, 24, 26, 30, 32 | II. Sampling and Experimentation:  Planning and conducting a study  A. Overview of methods of data collection  3. Experiment  4. Observational study  C. Planning and conducting experiments  1.Characteristics of a well-designed and well-conducted experiment  2.Treatments, control groups, experimental units, random assignments and replication  3.Sources of bias and confounding, including placebo effect and blinding  4.Completely randomized design  5. 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 |
| 5 days | *Unit Assessments*   * Quiz – Chapter 11 * Quiz – Chapter 12 * Unit 3 Review * Unit 3 Multiple Choice Test * Unit 3 Free Response Test |  |

Unit 4A – Randomness and Probability (12 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 3 days | *Chapter 14 – From Randomness to Probability*  Topics covered:   * Difference between randomness and chaos * Probability as a Long Run Relative Frequency * Language of Probability – Trials, Outcomes, and Events, Sample Space * Fundamental Counting Rule * General Idea of Independence * Law of Large Numbers * Basic Rules of Probability * Complement Rule * Addition Rule for Disjoint Events * Multiplication Rule for Independent Events * Union and Intersection of Two Events * Introduction to Venn Diagrams   Assignments:   * Read Chapter 14 pgs 274-285 * Complete Chapter 14 Reading Guide * Pg 285-288 #8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 21 | III. Anticipating Patterns  A Probability  1. Interpreting probability, including long-run relative frequency interpretations.  2.“Law of Large Numbers” concept  3.Addition rule, multiplication rule, conditional probability, and independence |
| 5 days | *Chapter 15 – Probability Rules*  Topics covered:   * Probability for Equally Likely Events * General Addition Rule * Conditional Probability * General Multiplication Rule * Formal Idea of Independence * Independent Events vs. Disjoint Events (Revisited) * Drawing with and without Replacement * Making a Picture – Venn Diagrams, Probability Tables, and Tree Diagrams * Introduction to Bayes’ Rule   Assignments:   * Read Chapter 15 pgs 289-305 * Complete Chapter 15 Reading Guide * Pg 305-308 #1, 2, 3, 6, 7, 8, 10, 15, 16, 17, 18, 23, 24, 26, 28, 30, 32, 33, 34, 35 | III. Anticipating Patterns  A. Probability  1. Interpreting probability, including long-run relative frequency interpretations.  2.“Law of Large Numbers” concept  3.Addition rule, multiplication rule, conditional probability, and independence |
| 4 days | *Unit Assessments*   * Quiz – Chapter 14 * Quiz – Chapter 15 * Unit 4A Review * Unit 4A Test |  |
| 3 days | *Semester Review and Exam* |  |

Unit 4B –Randomness and Probability (13 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 4 days | *Chapter 16 – Random Variables*  Topics covered:   * Random Variables * Discrete and Continuous Random Variables * Creating a Probability Model for Discrete Variables * Expected Values of Random Variables * Variance and Standard Deviation of Random Variables * Linear Transformations of Random Variables * Combining Independent Random Variables * Combining Normal Random Variables * TI: Calculating Mean and Standard Deviation for Probability Models   Assignments:   * Read Chapter 16 pgs 309-320 * Complete Chapter 16 Reading Guide * Pg 321-324 #1, 2, 3, 4, 5, 6, 15, 16, 18, 19, 21, 22, 24, 25, 27, 28, 33, 34, 37, 38 | III. Anticipating Patterns  A. Probability  4.Discrete random variables and their probability distribution, including binomial and geometric  6.Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable  B. Combining independent random variables  1.Notion of independence versus dependence  2. Mean and standard deviation for sums and differences of independent random variables. |
| 5 days | *Chapter 17 – Probability Models*  Topics covered:   * Properties of Bernoulli Trials * Properties of the Geometric Model * Calculating Geometric Probabilities * Calculating the Expected Value and Standard Deviation for a Geometric Model * Properties of the Binomial Model * Calculating Binomial Probabilities * Calculating the Expected Value and Standard Deviation for a Binomial Model * Simulating Binomial and Geometric Probability Models * Normal Approximation to the Binomial Model * TI: Calculating Geometric Probabilities, Calculating Binomial Probabilities   Assignments:   * Read Chapter 17 pgs 325-336 * Complete Chapter 17 Reading Guide * Pg 336-339 #3, 4, 5, 7, 8, 11, 12, 13, 14, 15, 16, 18, 19, 20, 29, 30 | III. Anticipating Patterns  A. Probability  4.Discrete random variables and their probability distribution, including binomial and geometric  5.Simulation of random behavior and probability distributions  6.Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable  B. Combining independent random variables  1. Notion of independence versus dependence  2. Mean and standard deviation for sums and differences of independent random variables. |
| 4 days | *Unit Assessments*   * Quiz – Chapter 16 * Unit 4B Review Activity – Probability Around the World * Unit 4B Test |  |

Unit 5 – From the Data at Hand to the World at Large (32 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 6 days | *Chapter 18 – Sampling Distribution Models*  Topics covered:   * Simulating a Sampling Distribution Model * Sampling Variability * Describing the Sampling Distribution Models for Sample Proportions in terms of Center, Spread, and Shape * Assumptions and Conditions for the Sampling Distribution Model of Sample Proportions * Calculating Probabilities Based on the Sampling Distribution Model of Sample Proportions * Describing the Sampling Distribution Models for Sample Means in terms of Center, Spread, and Shape * Central Limit Theorem * Assumptions and Conditions for the Sampling Distribution Model of Sample Means * Calculating Probabilities Based on the Sampling Distribution Model of Sample Means * Law of Diminishing Returns * Standard Error of the Sampling Distribution Model   Lab Activity:   * Flipping Coins Lab – Using a penny, students will flip the coin 25 times, recording the proportion of heads and repeat this several times. By combining the data, the class will explore the sampling distribution for sample proportions.   Applets:   * Convergence of the Sum of Dice to Normality <http://www.stat.sc.edu/~west/javahtml/CLT.html> * Central Limit Theorem for Means <http://www.ruf.rice.edu/~lane/stat_sim/sampling_dist/>   Projects:   * Simulated Coins Investigative Task – Students will explore and describe the sampling distribution for sample proportions using a random number generator to simulate the flipping of a fair coin.   Assignments:   * Read Chapter 18 pgs 347-362 * Complete Chapter 18 Reading Guide * Pg 362-365 #1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 28, 29, 30, 33 | III. Anticipating Patterns. .  D. Sampling distributions  1.Sampling distribution of a sample proportion  2.Sampling distribution of a sample mean  3.Central Limit Theorem  6.Simulation of sampling distributions |
| 5 days | *Chapter 19 – Confidence Intervals for Proportions*  Topics covered:   * Sampling Variability * Estimating Population Parameters * Point Estimates * Margin of Error * Interpreting Confidence Levels * Critical Values of z\* * Creating a One-Proportion Z-Interval * Interpreting Confidence Intervals * Assumptions and Conditions for a One-Proportion Z-Interval * Calculating Minimum Sample Size for a given Margin of Error * TI: Calculating a One-Proportion Z-Interval   Lab Activities:   * Skittles Lab – Using a bag of Skittles, students will sample with replacement, recording the proportion of red skittles in 30 draws, and create a confidence interval to estimate the proportion of red skittles. Students will graph their CI on the chart paper on the board to illustrate the concepts of sampling variability and confidence level.   Applets:   * Understanding Confidence [http://bcs.whfreeman.com/ips4e/cat\_010/ applets](http://bcs.whfreeman.com/ips4e/cat_010/%20applets)[/confidenceinterval.html](http://bcs.whfreeman.com/ips4e/cat_010/applets/confidenceinterval.html)   Assignments:   * Read Chapter 19 pgs 366-377 * Complete Chapter 19 Reading Guide * Pg 378-381 #1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 20, 21, 22, 23, 24, 25, 26, 30 | IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  1.Estimating population parameters and margins of error  2.Properties of point estimators, including unbiasedness and variability  3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals.  4.Large sample confidence interval for a proportion |
| 5 days | *Chapter 20 – Testing Hypotheses About Proportions*  Topics covered:   * Logic of a Hypothesis Test * Null vs. Alternate Hypotheses * Idea of Rejecting vs. Retaining the Null Hypothesis * Conducting a One-Proportion Z-Test * Calculating a Probability Value (P-Value) * Assumptions and Conditions for a One-Proportion Z-Test * One-sided vs. Two-sided Hypothesis Tests * Drawing Conclusions from our Data * How Hypothesis Tests and Confidence Intervals are Related * TI: Calculating a One-Proportion Z-Test   Applets:   * The Basics of Hypothesis Testing [http://bcs.whfreeman.com/sta/content/ chapterall/spt/significance/testsignificance.html](http://bcs.whfreeman.com/sta/content/%20chapterall/spt/significance/testsignificance.html)   Assignments:   * Read Chapter 20 pgs 382-398 * Complete Chapter 20 Reading Guide * Pg 398-400 #1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24 | IV. Statistical Inference  B. Test of significance  1.Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests  3.Large sample test for a proportion |
| 4 days | *Chapter 21 – More About Tests*  Topics covered:   * P-values as a Conditional Probability * Making a Decision based on an Alpha Level * Critical Values for a Hypothesis Test * Comparing a Hypothesis Test to a Confidence Interval * Type I and Type II Errors * Power of the Test * The Relationship between Alpha, Beta, and Power * Effect Size   Applets:   * Relationship Between Type I Errors, Type II Errors, and the Power of the Test   <http://www.intuitor.com/statistics/T1T2Errors.html>  Project:   * Making a Decision Project – Students will create an original scenario, identifying the null and alternate hypotheses and then describing the Type I error, Type II error and Power of the test in the context of their scenario.   Assignments:   * Read Chapter 21 pgs 401-417 * Complete Chapter 21 Reading Guide * Pg 418-420 #1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14 | IV. Statistical Inference  B. Test of significance  1.Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests  2.Concepts of Type I and Type II errors and concept of power |
| 4 days | *Chapter 22 – Comparing Two Proportions*  Topics covered:   * Sampling Distribution Model for the Difference Between Two Independent Proportions * Assumptions and Conditions for Two-Proportion Inference * Creating a Two-Proportion Z-Interval * Idea of Pooling * Conducting a Two-Proportion Z-Test * Relationship between an Interval and a Test * TI: Calculating a Two-Proportion Z-Interval, Calculating a Two-Proportion Z-Test   Assignments:   * Read Chapter 22 pgs 421-432 * Complete Chapter 22 Reading Guide * Pg 433-435 #1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 21, 22 | III. Anticipating Patterns. .  D. Sampling distributions  4.Sampling distribution of a difference between two independent sample proportions  IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  5.Large sample confidence interval for a difference between two proportions  B. Test of significance  4.Large sample test for a difference between two proportions |
| 8 days | *Unit Assessments*   * Quiz – Chapter 18 * Quiz – Chapter 19 * Quiz – Chapter 20 * Quiz – Chapter 22 * Unit 5 Lab Activity – Pass the Pigs Lab – Students will gather data using the game “Pass the Pigs”, then analyze the data, using all of the inference techniques from Unit 5. * Unit 5 Review * Unit 5 Multiple Choice Test * Unit 5 Free Response Test |  |

Unit 6 –Learning About the World (10 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 3 days | *Chapter 23 – Inferences About Means*  Topics covered:   * Standard Error of the Sample Mean * T-distribution * Degrees of Freedom * When to Use the Z-distribution vs. the T-distribution * Assumptions and Conditions for Inference for Means * Calculating a One-Sample T-Interval for Means * Interpreting a Confidence Interval for Means * Normal Probability Plots Revisited * Conducting a One-Sample T-Test for Means * Drawing a Conclusion Based on a Test for Means * Relationships between Intervals and Tests * Calculating a Minimum Sample Size for a Given Margin of Error * TI: Calculating probabilities for the T-distribution, Calculating a One-Sample T-Interval, Calculating a One-Sample T-Test   Lab Activity:   * JellyBlubber Lab – Students will gather data by taking an SRS of JellyBlubbers in order to estimate the true mean length of the colony by creating a confidence interval for the mean. Students will then chart the intervals on a class graph to illustrate the meaning of 95% confidence.   Assignments:   * Read Chapter 23 pgs 443-461 * Complete Chapter 23 Reading Guide * Pg 461-465 #1, 2, 7, 8, 9, 10, 11, 12, 17, 18, 19, 20, 23, 24, 25, 26, 27, 28 | III. Anticipating Patterns. .  D. Sampling distributions 7.t-distribution  IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  1.Estimating population parameters and margins of error  2.Properties of point estimators, including unbiasedness and variability  6.Confidence interval for a mean  B. Test of significance  5.Test for a mean |
| 2 days | *Chapter 24 – Comparing Means*  Topics covered:   * Sampling Distribution Model for the Difference Between Two Independent Means * When to Use the Z-distribution vs. the T-distribution * Assumptions and Conditions for Two-Sample Inference for Unpaired Means * Creating a Two-Sample T-Interval for Unpaired Means * Idea of Pooling * Conducting a Two-Sample T-Test for Unpaired Means * Relationship between an Interval and a Test * TI: Calculating a Two-Sample T-Interval for Unpaired Means, Calculating a Two-Sample T-Test for Unpaired Means   Assignments:   * Read Chapter 24 pgs 466-484 * Complete Chapter 24 Reading Guide * Pg 485-490 #1, 2, 3, 5, 6, 7, 9, 10, 26, 27 | III. Anticipating Patterns. .  D. Sampling distributions  5.Sampling distribution of a difference between two independent sample means  IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  7.Confidence interval for a difference between two means (unpaired and paired)  B.Test of significance  6.Test for a difference between two means (unpaired and paired) |
| 3 days | *Chapter 25 – Paired Samples and Blocks*  Topics covered:   * Paired Data vs. Independent Samples * Assumptions and Conditions for Inference for Paired Means * Creating a Matched-Pairs T-Interval for Means * Conducting a Matched-Pairs T-Test for Means * TI: Creating a Matched-Pairs T-Interval for Means, Conducting a Matched-Pairs T-Test for Means   Lab Activities:   * Timing Your Reaction Lab – Students will gather data using a Reaction Timer for their dominant and non-dominant hands and analyze the data using 2-sample inference methods for independent samples (males vs. females) and dependent samples (dominant vs. non-dominant)   Assignments:   * Read Chapter 25 pgs 491-502 * Complete Chapter 25 Reading Guide * Pg 503-507 #1, 2, 3, 5, 7, 8, 11, 12, 14, 15, 20, 21 | IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  7.Confidence interval for a difference between two means (unpaired and paired)  B. Test of significance  6.Test for a difference between two means (unpaired and paired) |
| 2 days | *Unit Assessments*   * Unit 6 Review * Unit 6 Test |  |

Unit 7 –Inference When Variables Are Related (10 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 5 days | *Chapter 26 – Comparing Counts*  Topics covered:   * Chi-Square Distribution * Chi-Square Test of Goodness of Fit * Assumptions and Conditions for Chi-Square Tests * Expected Counts vs. Observed Counts * Chi-Square Test of Homogeneity * Chi-Square Test of Independence * TI: Calculating a Chi-Square Test for Goodness of Fit, Calculating a Chi-Square Test for a Table   Lab Activities:   * Chi Square M&Ms Lab – Students will gather data on Plain and Peanut Butter M&Ms in order to illustrate the difference between Chi Square Tests for Goodness of Fit, Independence, and Homogeneity   Assignments:   * Read Chapter 26 pgs 518-537 * Complete Chapter 26 Reading Guide * Pg 537-542 #1, 2, 3, 5, 6, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20 | III. Anticipating Patterns. .  D. Sampling distributions  8.Chi-square distribution  IV. Statistical Inference  B. Test of significance  7.Chi-square test for goodness of fit, homogeneity of proportions and independence (one- and two-way tables) |
| 3 days | *Chapter 27 – Inferences for Regression*  Topics covered:   * Idealized Regression Model * Assumptions and Conditions for Inference for Regression * Sampling Distribution Model for the Slope of the Regression Line * Constructing a T-Interval for the Slope of the LSRL * Conducting a T-Test for the Slope of the LSRL * Reading Computer Output * TI: Calculating a T-Interval for the Slope, Calculating a T-Test for the Slope   Assignments:   * Read Chapter 27 pgs 542-563 * Complete Chapter 27 Reading Guide * Pg 563-571 #1, 2, 3, 4, 7, 8, 9, 10, 13, 14, 15, 21 | IV. Statistical Inference  A. Estimation (point estimators and confidence intervals)  8.Confidence interval for the slope of a least-squares regression line  B.Test of significance  8.Test for the slope of a least-squares regression line |
| 2 days | *Unit Assessments*   * Unit 7 Review * Unit 7 Test |  |

Unit 8 –AP Exam Review (12 days)

|  |  |  |
| --- | --- | --- |
| Number of Days | Chapter/Topic/Activity/Assignments | AP Statistics Course Topic Outline |
| 11 days | *Review for AP Exam*  Topics covered:   * Mock AP Exam using 2002 Released Multiple Choice and most recently released Free Response * Practice Multiple Choice Questions from AP Review Books * Practice Multiple Choice Questions from Acorn Book * Item Analysis of Practice Exams * Practice Investigative Tasks from previously released Free Response * Review sessions after school for each unit of material covered * Topic Outline with detailed review |  |
| 1 day | AP Exam!! |  |

Assessment:

Assessment and evaluation are essential to learning and teaching. Ongoing assessment and evaluation are significant in supporting student achievement, motivating student performance and providing the basis upon which teachers make meaningful instructional decisions. All aspects of progress in mathematics are measured using multiple methods such as authentic, performance, observational, and formative assessments; group and individual projects, student presentations, and conventional summative assessments. Student understanding is evaluated using an assessment cycle that includes pre-, formative and summative assessments. Pre-assessments are used to determine where the student understanding level is, as the unit is begun. The pre-assessment is used by a teacher to plan instruction. Formative assessments are used to check student understanding while learning is occurring, and provide students and teachers with learning progress information. Pre- and formative assessments are not used to determine grades. Summative assessments, such as unit and semester tests, evaluate student achievement, and along with other measures such as student presentations and project work are data points used to determine the level of student performance.

|  |  |  |
| --- | --- | --- |
| Assessment Type | Goal | Description |
| Unit Quizzes | To assess understanding of concepts, principles, applications, and techniques of that chapter, To diagnose preparedness for cumulative exam. | 30-45 minute tests containing multiple-choice items and short answer questions |
| Cumulative Chapter Tests | To provide continuous review and integration of topics, all tests are cumulative, but focused on the most recent chapters | 60-90 minute tests containing multiple-choice items, problems to solve, and constructed response items. |
| Student Projects/Investigations | To provide students with an opportunity to examine a statistics or probability topic in greater depth and demonstrate the processes and skills of a well-designed statistical investigation | Short term projects in which students work in a small group or individually, to research a statistics topic. |

Supporting Services:

All students in the school have a seminar period two or three days a week of 80 minutes in which they are allowed to use computer facilities in the library; visit a classroom teacher for additional instruction, review, or personalized help; or meet and work with other students on projects, review for tests, view videos, etc.