AP Statistics – Course Syllabus
Instructor: Mr. Porinchak

Course Expectations:
Reasoning based on probability and statistics gives modern society the ability to cope with uncertainty. It has astonishing power to improve decision-making accuracy and test new ideas. It’s a key analytical tool used in education, the social sciences, and business administration and is often a required college subject for majors in those areas. Statistics is frequently used for data analysis in the sciences and forms the mathematical basis for quality control in manufacturing. AP Statistics is a college level class for students who have been highly successful in Algebra II or Pre-Calculus. It covers the topics needed for the American College Board AP Statistics exam. Students passing this test may receive college credit. In today's world, most statistical analysis is done on calculators or computers. Students will learn how to perform statistical analysis on TI-84 calculators as well as more traditional techniques. All students taking AP Statistics are ENCOURAGED to take the AP Statistics Exam at the end of the course.

Who Should Take This Class:
Students with an interest in careers related to: business, the social sciences including psychology, education, or math. The class is also helpful to careers in engineering and the sciences.

Materials:
- Texas Instruments Ti-84 calculator (any edition will do), all students MUST have one of their own.
- Three-ring binder with folder and loose leaf paper.

Additional Recommended Readings:
Open Intro's Advanced High School Statistics by David Diez and Christopher Barr

Communicating Through the Vocabulary of Statistics:
This course is organized as an activity-based course where each day is setup with an interactive lesson and afterwards students will be engaged in the exploration of statistical relationships and realities. Because of this students will be asked to stay up to date on what we are engaged in learning. Communication with your classmates and teacher is crucial to student achievement. Students will learn many statistical techniques and will be taught and required to communicate these in a variety of ways in the context of activities, projects, quizzes, tests, and discussions. As students become more proficient “statisticians,” they will learn to communicate their processes, analysis, results, findings, and conclusions using correct and effective statistics vocabulary. This idea of communication through statistics is one of the main goals of this course. Statistics are all around us and many people see them and recognize them, but truly being able to understand statistics, what they mean, and what they infer is what is most important. This course will teach students how to communicate these understandings in an organized and meaningful way.

Course Content Overview (Unit Overview):
The topics for AP Statistics are divided into four major themes: exploring data (20-30 percent of the exam), sampling and experimentation (10-15 percent of the exam), anticipating patterns through probability (20-30 percent of the exam), and statistical inference (30-40 percent of the exam). A short description of each topic is below and a full pacing guide for the course is at the end of the syllabus that shows all topics being taught.

1.) Exploring Data: Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. In examining distributions of data, students should be able to detect important characteristics, such as shape, location, variability and unusual values. From careful observations of patterns in data, students can generate conjectures about relationships among variables. The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression. The difference between association and causation must accompany this conceptual development throughout.

Unit 1 - Analyzing One Variable Data

Graphical Displays – Students become familiar with graphical portrayal of data, for example, using box and whisker plots, stem plots, and histograms. Students will not only create graphical displays but also analyze them in describe the shape, center, spread, as well as any unusual features of the graph all in context.
Summarizing Distributions with Numerical Values – Students become familiar with descriptive statistics such as the five-number summary, median, mean, variance, and standard deviation. Measuring the center; median and mean; measuring the spread; range, interquartile range, variance, and standard deviation; measuring position: simple ranking, percentile ranking, and z-score; empirical rule; histograms and measures of central tendency; histograms, z-scores, and percentile rankings; cumulative frequency and skewness; boxplots; effect of changing units. When presented with data students will use both graphical display and numerical descriptions to describe the data in context.

Comparing Distributions – Graphical examples and numerical examples of data will be analyzed frequently especially with real world problems that students can relate to. Students will work to analyze multiple displays of data in order to compare and contrast them. Dot-plots; double bar charts; back-to-back stem-plots; parallel boxplots; cumulative frequency plots will all be used to compare data sets in context.

Unit 2 – Analyzing Two Variable Data

Exploring Bivariate Data – Students will explore the relationships between two categorical variables by using two way tables and graphical displays that allow students to find the relationships and associations between variables. Students will also explore relationships between two quantitative variables through scatterplots, correlations and linearity, least squares regression line, residual plots, outliers, and influential points. When analyzing a linear regression between two quantitative variables students will describe and discuss those relationships in context.

2.) Sampling and Experimentation: Data must be collected according to a well-developed plan if valid information is to be obtained. If data are to be collected to provide an answer to a question of interest, a careful plan must be developed. Both the type of analysis that is appropriate and the nature of conclusions that can be drawn from that analysis depend in a critical way on how the data was collected. Collecting data in a reasonable way, through either sampling or experimentation, is an essential step in the data analysis process.

Unit 3 – Sampling and Experimental Design

This unit provides instruction in the methods of data collection. The methods of simple random, stratified random and systematic sampling are discussed and their appropriateness for different situations evaluated. Students plan and justify a sampling procedure for given real-life sampling problems. These scenarios span the sampling procedures, and include situations where different possible strategies are arguably reasonable. In student planning, specific issues of potential bias must be addressed. It is not necessary to actually solve completely any issues of bias, but limitations must be noted. Students will have assignments that ask them to plan and conduct their own study. They will be asked to clearly describe their sampling methods and ensure that their methods will avoid multiple forms of bias.

This unit provides instruction on planning and conducting experiments. Students will learn about experiments versus observational studies versus surveys, confounding variables, control groups, placebo effects, and blinding, treatments, experimental units, and randomization, completely randomized design for two treatments, randomized paired comparison design, replication, blocking, and generalizability of results. Students are presented with problems of experimental design gleaned from newspapers and/or newsmagazine reports. Students will be tasked to find articles on their own from multiple sources and explain the design issues as presented in the report, and flesh out the details as they would improve on the experiment.

3.) Anticipating Patterns through Probability: Probability is the tool used for anticipating what the distribution of data should look like under a given model. Random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. The mathematical description of variation is central to statistics. The probability required for statistical inference is not primarily axiomatic or combinatorial but is oriented toward using probability distributions to describe data.

Unit 4 – Probability

This unit provides instruction on probability as relative frequency. Students will learn the law of large numbers, the addition rule, the multiplication rule, conditional probabilities, and identifying independence through conditional probabilities. Students will use probability and simulation to model random behavior in real contexts.
Unit 5 – Random Variables

This unit provides instruction on exploring random phenomena using probability and simulation, including distributions of both discrete and continuous random variables. Students will learn about discrete random variables and their probability distributions, continuous random variables, simulations of probability distributions, including binomial and geometric; mean (expected value) and standard deviation of a random variable, including binomial. This unit also covers combining independent random variables and calculating the mean and standard deviation for sums and differences of independent random variables. Finally this unit will discuss the Normal Distribution by exploring properties of the normal distribution; using tables of the normal distribution; the normal distribution as a model for measurement; commonly used probabilities and z-scores; finding means and standard deviations; normal approximation to the binomial.

Unit 6 – Sampling Distributions

This unit provides instruction on sampling distributions. The students will be provided with opportunities to create and analyze sampling distributions for both sample proportions and sample means. The center, spread, and shape of sampling distributions will be analyzed in context to specific problems.

4.) Statistical Inference: Statistical inference guides the selection of appropriate models. Models and data interact in statistical work: models are used to draw conclusions from data, while the data are allowed to criticize and even falsify the model through inferential and diagnostic methods. Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how confident one can be about the selection.

Unit 7 – Estimating with Confidence

This unit provides instruction on Confidence Intervals. This unit explains: Logic of confidence intervals; margin of error, and confidence intervals for population proportions and means.

Unit 8 – Significance Tests

This unit provides instruction on testing hypotheses with significance tests. The unit explains: Logic of significance testing; null and alternative hypotheses, P-values, one and two sided test, significance test for population proportions, population means, and for paired data, Type I and Type II errors, and the concept of power.

Unit 9 – Comparing Two Samples

Comparing Two Sample Means – Confidence intervals for the difference between two sample means; hypothesis tests for the difference between two sample means; tests for paired samples and blocks.

Comparing Two Sample Proportions – Confidence intervals for the difference between two sample proportions; hypothesis tests for the difference between two sample proportions.

Unit 10 – Inference for Categorical Data

Tests of Significance: Chi Squared– Chi-squared test for goodness of fit; chi-squared test for independence; chi-squared test for homogeneity of proportions.

Unit 11 – Inference for Regression Lines

Test of Significance: Slope of Least Squares Line – Inference for slope of least squares line.

Unit 12 – AP Exam Review
**Course Outline (a detailed pacing guide is at the end of the syllabus):**
The course has twelve large units that cover all topics in the AP statistics curriculum as outlined in the AP Statistics Course Description. The outline below goes over all of those topics (which are outlined in the pacing guide)

I. Exploring Data:
   A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, 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, mean
      2. Measuring spread: range, interquartile range, standard deviation
      3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
      4. Using boxplots
      5. The effect of changing units on summary measures
   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
   D. Exploring bivariate data
      1. Analyzing patterns in scatterplots
      2. Correlation and linearity
      3. Least-squares regression line
      4. Residual plots, outliers and influential points
      5. Transformations to achieve linearity: logarithmic and power transformations
   E. Exploring categorical data
      1. Frequency tables and bar charts
      2. Marginal and joint frequencies for two-way tables
      3. Conditional relative frequencies and association
      4. Comparing distributions using bar charts

II. Sampling and Experimentation:
   A. Overview of methods of data collection
      1. Census
      2. Sample survey
      3. Experiment
      4. Observational study
   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
   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

III. Anticipating Patterns:
   A. Probability
1. Interpreting probability, including long-run relative frequency interpretation
2. "Law of Large Numbers" concept
3. Addition rule, multiplication rule, conditional probability and independence
4. Discrete random variables and their probability distributions, 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

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

D. Sampling distributions
1. Sampling distribution of a sample proportion
2. Sampling distribution of a sample mean
3. Central Limit Theorem
4. Sampling distribution of a difference between two independent sample proportions
5. Sampling distribution of a difference between two independent sample means
6. Simulation of sampling distributions
7. t-distribution
8. Chi-square 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
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. Large sample confidence interval for a difference between two proportions
6. Confidence interval for a mean
7. Confidence interval for a difference between two means (unpaired and paired)
8. Confidence interval for the slope of a least-squares regression line

B. Tests of significance
1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
2. Large sample test for a proportion
3. Large sample test for a difference between two proportions
4. Test for a mean
5. Test for a difference between two means (unpaired and paired)
6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)
7. Test for the slope of a least-squares regression line

Practice Test: A full-scale practice test will be set up for you. It is extremely beneficial to take a mock test not only for practice but so that you are comfortable with the exam when you actually take it.

Preparing for the AP Exam:
Students will prepare for the AP Exam as we move throughout the semester. Tests and quizzes will be modeled after the AP Exam. We will also look at past AP questions on a regular basis as we learn new topics. Each student will take a full length practice exam in preparation for the exam. Students will also be encouraged to explain their learning process, discussing what they think should be included in a correct response. This preparation step is crucial because students need to understand how to work through problems. Lastly, we will have around a week at the end of the course before the AP Exam to study and practice extensively in class.
Note on Graphing Calculator and other Technology:
The use of the Ti-84 graphing calculator is an integral part of this course. They will be used on a daily basis. You will use this technology routinely to construct your own understanding of the principles and practices of statistics. The course teaches students how to use graphing calculators to enhance the development of statistical understanding through exploring data, assessing models, and/or analyzing data. You will be actively engaged in using your calculator to explore and analyze data, assess models, and perform simulations. We will also be using Internet websites to assess models and use the List features of their calculators. Technology is incorporated throughout the text, including the use of graphing calculators. Each chapter in the text has a section on calculator use to give the students instruction and practice with the statistical capabilities of the calculator. Also several of the videos for this course actively show how to properly use the calculator for problems in that unit. The course teaches students how to use graphing calculators, tables, or computer software to enhance the development of statistical understanding through performing simulations.

Tests and Quizzes:
Each unit will include a test and quizzes. The tests will consist of both multiple choice and free-response questions. They will be graded in the same format as the AP exam.

Unit Review Activities:
Throughout the semester a few projects will be given in the form of unit activities. These tasks will require you to make connections between all aspects of the statistical process, including design, analysis, and conclusions. Most look at real world situations and scenarios, where students must use what we have learned up to that point to create a well developed report of what is asked of you. Ultimately, these tasks will help you develop into interpreters and investigators of statistical data and information.

Participation:
As students progress through the course, they will be expected to watch the lesson videos and try the practice problems before reviewing their answers with the practice problem videos. Participation of these tasks is crucial to students developing an understanding of the topics and concepts.

Projects:
There will be two projects in this course. One over Unit 2 on Analyzing Relationship between Two Variables and one after the AP test has been concluded. Details of these projects can be found in the pacing guide.

Student grades will be weighted as such:
60% Tests
25% Quizzes
10% Unit Review Activities
5% Participation

Unit 1 – One Variable Data

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Intro course Lesson 1.1 | • Identify the individuals and variables in a set of data.  
• Classify variables as categorical or quantitative.                                                                                       |                                   |
| 2   | Lesson 1.2   | • Display categorical data in a bar graph or pie chart  
• Display categorical data in a relative bar graph                                                                                           | I: E 1                            |
| 3   | Lesson 1.2   | • Calculate marginal and relative marginal distributions from a two way table  
• Calculate conditional and relative conditional distributions from a two way table.                                                           | I: E 1, 2, 3, 4                   |
<p>| 4   | Quiz over lessons 1.1 and 1.2                                                                                                                  |                                    |</p>
<table>
<thead>
<tr>
<th>Lesson</th>
<th>Topics</th>
</tr>
</thead>
</table>
| Lesson 1.3 | • Make dotplots of quantitative data  
• Interpret the shape of a dotplot in context  
• Interpret the center of a dotplot in context  
• Interpret the spread of a dotplot in context  
• Interpret an unusual feature of a dotplot in context  
• Compare distributions between 2 dotplots in context |
| Lesson 1.4 | • Make stemplot of quantitative data  
• Interpret the shape of a stemplot in context  
• Interpret the center of a stemplot in context  
• Interpret the spread of a stemplot in context  
• Interpret an unusual feature of a stemplot in context  
• Compare distributions between 2 stemplots in context |
| Lesson 1.5 | • Make histograms (and relative histograms) of quantitative data  
• Interpret the shape of a histogram in context  
• Interpret the center of a histogram in context  
• Interpret the spread of a histogram in context  
• Interpret an unusual feature of a histogram in context  
• Compare distributions between 2 histograms in context |
| Lesson 1.6 | • Calculate the mean of quantitative data in context  
• Calculate the median of quantitative data in context  
• Calculate the quartiles of quantitative data in context  
• Describe how the shape of data affects the median and mean of the data  
• Use Ti-84 to calculate mean and median of quantitative data  
• Calculate the range of quantitative data in context  
• Calculate and interpret the standard deviation of quantitative data in context  
• Calculate the interquartile range of quantitative data  
• Use Ti-84 to calculate standard deviation and IQR of quantitative data |
| Lesson 1.7 | • Make and interpret boxplots of quantitative data  
• Calculate outliers in a set of quantitative data  
• Make decisions on the measures of center and spread for a specific set of data |
| Lesson 1.8 | • Compare box plots if two sets of quantitative data |

*The students will have an assignment where they must properly use their Ti-84 calculator to explore a set of data. They will use the calculator to make a graphical display of the data and find a numerical description of the data. They will then describe the data using that information in context.

*Students will also have an assignment where they must gather a graphical display from a newspaper or magazine. Then using the vocabulary we have learned in this unit, the students will describe in context what that graphical display is telling the reader.

| Lesson 1.9 | • Find and interpret the percentile of an individual value within a set of quantitative data  
• Interpret a cumulative relative frequency graph  
• Find and interpret the standardized score (z-score) of a value with a set of quantitative data  
• Describe the effects of transforming data by adding, subtracting, multiplying by, or dividing by a constant to all data values in a set |
| Lesson 1.9 | • Quiz over Lesson 1.9 |
16 | Lesson 1.10 | • Understand a density curve and how they represent distributions.  
• Estimate areas in a Normal distributions  
III: C 1, 2, 3

17 | Lesson 1.10 | • Use a Ti-84 calculator to find the proportion of a distribution in a specified interval.  
• Use a Ti-84 calculator to identify the z-score from a given percentile  
• Solve problems based on the Normal model distribution  
III: C 1, 2, 3

18 | Quiz over Lesson 1.10 |

19 | Unit Activity Unit Review | Work on a unit review activity that will require students to bring together all aspects of the statistical process, including design, analysis, and conclusions that we have learned in this unit.

20 | Unit 1 Test |

---

**Unit 2 – Two Variable Data**

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Lesson 2.1 | • Describe the association between two categorical variables in a two way table.  
*The students will work to use the proper vocabulary to describe the relationship between two categorical variables in context. They will be asked to incorporate graphical displays of the data to also examine that relationship and association. | I: E 1, 2, 3, 4 |
| 2   | Lesson 2.2 | • Identify explanatory and response variables in scenarios where one variable explains another variable.  
• Make a scatterplot to display the relationship between two quantitative variables  
• Describe the direction, form, and strength of a relationship between two quantitative variables.  
• Identify outliers in a scatterplot | I: D 1 |
| 3   | Lesson 2.3  
Lesson 2.4 | • Interpret the correlation between two quantitative variables.  
• Identify the correct scenario to use correlation  
• Understand the basic properties of correlation  
• Understand the formula to calculate correlation but not necessarily use it  
• Calculate the correlation on their Ti-84 calculator  
• Explain how correlation is influenced by outliers. | I: D 1, 2 |
| 4   | | Quiz over Lesson 2.1, 2.2, 2.3, and 2.4 |
| 5   | Lesson 2.5 | • Find the least squares regression line with the Ti-84 calculator  
• Interpret the slope and y-intercept of a least squares regression line  
• Use the least squares regression line to predict y from a given x.  
• Explain why you cannot extrapolate | I: D 1, 2 |
| 6   | Lesson 2.5 | • Calculate and interpret residuals  
• Find the slope and y-intercept of a least squares regression line using the means and standard deviations of x and y and their correlation.  
• Explain the why it gets its name the least squares regression line | I: D 1, 2, 3 |
| 7   | Lesson 2.6 | • Construct and interpret residual plots to determine whether a linear model is an appropriate model to describe relationship between two quantitative variables.  
• Interpret coefficient of determination (r-squared) to determine how well a least squares regression line models the relationship between two variables. | I: D 1, 2, 3, 4 |
| 8   | Lesson 2.6 | • Interpret the standard deviation of the residuals to determine how well a least squares | I: D 1, 2, 3, 4 |
regression line models the relationship between two variables. 
- Describe how outliers influence the correlation, slope, and y-intercept of a least squares regression line.

9 Lesson 2.7
- Identify and interpret the least squares regression line from a computer output table.

*Students will use computer output to better understand and analyze the relationship between two quantitative variables. They will be tasked to correctly identify and interpret, using the proper language of statistics, what the computer output tells about the linear regression between the two quantitative variables.

10 Quiz over lesson 2.5, 2.6, and 2.7

11 Unit Activity Unit Review
Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions.

*Students will work throughout this unit on a project will they will collect two quantitative variables from the same set of individuals. They will then analyze that data in a scatterplot and calculate the least squares regression line for that data. They will write a detailed report including graphical displays, regression analysis, and a report on the reliability of their regression. The students will be tasked to use the proper vocabulary of linear regression to describe methods, results, and interpretations in order to complete the assignment.

12 Unit 2 Test

### Unit 3 – Sampling and Experimentation

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Lesson 3.1 | • Identify the population and the sample in a study  
     • Identify a census versus a sample  
     • Explain the idea of a sample to estimate a population  
     • Describe how to obtain a random sample using technology and a table of random numbers | II: A 1, 2  
II: B 2 |
| 2   | Lesson 3.2 | • Identify and distinguish simple random samples, stratified samples, cluster samples, and systematic samples from each other.  
     • Give advantages and disadvantages to each of the sampling methods. | II: A 2  
II: B 4 |
| 3   | Lesson 3.3 | • Identify convenience sampling and voluntary response sampling and explain how they lead to bias in surveys.  
     • Explain how under-coverage, nonresponse, and response bias can lead to bias in a survey | II: B 3 |
| 4   | Quiz over Lessons 3.1, 3.2, and 3.3 | | |
| 5   | Lesson 3.4 | • Explain the purpose of a statistical study  
     • Identify the explanatory and response variable to a statistical study  
     • Distinguish between an observational study and an experiment.  
     • Identify confounding variables and how they limit the effect of a cause and effect relationship. | II:A 2, 3 |
| 6   | Lesson 3.5 | • Identify the experimental units, explanatory and response variables, and the treatments in an experiment.  
     • Explain and recognize the importance of comparison in experimental design  
     • Explain and recognize the importance of randomization in experimental design  
     • Explain and recognize the importance of replication in experimental design  
     • Explain and recognize the importance of control in experimental design | II:A 3  
II: C 1, 2, 3 |
<table>
<thead>
<tr>
<th>Day</th>
<th>Lesson 3.5</th>
<th>Objectives: Describe the placebo effect and the use of a placebo to control for it. Describe the purpose of blinding in an experiment.</th>
<th>II: C 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Lesson 3.5</td>
<td>Describe a completely randomized design for an experiment. Describe the purpose of blocking in an experiment and how to create a randomized block design for an experiment. Describe a matched pair design for an experiment.</td>
<td>II: C 4, 5</td>
</tr>
<tr>
<td>9</td>
<td>Quiz over Lessons 3.4 and 3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Lesson 3.6</td>
<td>Interpret the meaning of statistically significant in the context of an experiment. Describe the scope of inference for a statistical study</td>
<td>II: D</td>
</tr>
<tr>
<td>11</td>
<td>Quiz over Lesson 3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Unit Activity Unit Review</td>
<td>Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Unit 3 Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Unit 4 – Probability

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lesson 4.1</td>
<td>Interpret and understand probability as a long run relative frequency Distinguish the difference between experimental probability and theoretical probability</td>
<td>III: A 1, 2</td>
</tr>
<tr>
<td>2</td>
<td>Lesson 4.2</td>
<td>Use simulations to understand long run behavior and probability Create a simulation to estimate the probability of an event.</td>
<td>III: A 5</td>
</tr>
<tr>
<td>3</td>
<td>Quiz over Lesson 4.1 and 4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lesson 4.3</td>
<td>Describe the sample space of a chance process Describe and create a probability model for a chance process Use basic probability rules to calculate probabilities involving two events.</td>
<td>III: A 3</td>
</tr>
<tr>
<td>5</td>
<td>Lesson 4.4</td>
<td>Use a two way table or Venn diagram to model a chance process and calculate probabilities involving two events. Use the general addition rule to calculate probabilities for events are mutually exclusive and not mutually exclusive.</td>
<td>III: A 3</td>
</tr>
<tr>
<td>6</td>
<td>Quiz over Lessons 4.3 and 4.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Lesson 4.5</td>
<td>Calculate and interpret conditional probabilities Use tree diagrams to model problems with probabilities involving two or more events.</td>
<td>III: A 3</td>
</tr>
<tr>
<td>Day</td>
<td>Topics</td>
<td>Objectives: The Students Will and complete assignments on:</td>
<td>AP Statistics Course Topic Outline</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>Lesson 4.6</td>
<td>• Use the general multiplication rule to calculate probabilities.</td>
<td>III: A 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use the multiplication rule to calculate probabilities for independent events.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate probabilities for non-independent events.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Lesson 4.7</td>
<td>• Determine if two events are independent</td>
<td>III: A 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Determine if two events are independent from a two way table</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Quiz over Lesson 4.5, 4.6 and 4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Unit Activity Unit Review</td>
<td>Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Unit 4 Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Unit 5 – Random Variables

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lesson 5.1</td>
<td>• Identify a random variable and distinguish between a discrete random variable and a continuous random variable.</td>
<td>III: A 4, 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Create a probability distribution based on a random variable.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lesson 5.2</td>
<td>• Fill in a probability distribution based on a discrete random variable.</td>
<td>III: A 4, 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate and interpret the mean (or expected value) of a discrete random variable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate and interpret the standard deviation of a discrete random variable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use Ti-84 to find the mean and standard deviation of a discrete random variable.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lesson 5.3</td>
<td>• Compute probabilities using the probability distribution of a continuous random variable.</td>
<td>III: C 1, 2, 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compute probabilities using the probability distribution of a continuous random variable that follows a Normal model.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Quiz over Lesson 5.1, 5.2, and 5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lesson 5.4</td>
<td>• Describe the effects of adding, subtracting, multiplying by, or dividing by a constant has on a random variable.</td>
<td>III: A 6</td>
</tr>
<tr>
<td>6</td>
<td>Lesson 5.4</td>
<td>• Find the mean and standard deviation of the sum or difference of two or more independent random variables.</td>
<td>III: B 1, 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate probabilities for the sum or difference of independent Normal random variables.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Quiz over Lesson 5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Lesson 5.5</td>
<td>• Describe the setting for a geometric random variable.</td>
<td>III: A 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate probabilities involving geometric random variables.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Lesson 5.6</td>
<td>• Check the conditions for using a binomial random variable.</td>
<td>III: A 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compute and interpret probabilities involving a binomial random variable.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Lesson 5.6</td>
<td>• Calculate the mean and standard deviation of a binomial random variable and interpret their meaning in context to a problem.</td>
<td>III: A 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Calculate probabilities on the Ti-84 calculator involving binomial random variables.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Quiz over Lessons 5.5 and 5.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Unit Activity</td>
<td>Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions.</td>
<td></td>
</tr>
</tbody>
</table>
## Unit 6 – Sampling Distributions

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Lesson 6.1     | • Identify the difference between a parameter and a statistics
• Use a sampling distribution to determine the likelihood of a claim about a parameter.
• Identify the difference between the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic.
• Describe the relationship between sample and variability of a statistic.
• Determine whether or not a statistic is an unbiased estimator of the population parameter.  
*Students will have an activity where they analyze computer generated simulations of samples to better understand what a sampling distribution is. They will then use that computer generated simulations to answer questions about a sampling distribution and the likeliness of sample statistics occurring. | III: D 6                           |
| 2   | Quiz over Lesson 6.1 |                                                                                                                             |                                   |
| 3   | Lesson 6.2     | • Find the mean and standard deviation of the sampling distribution of a sample proportion.
• Check the conditions needed for a sampling distribution of a sample proportion including the random condition, the 10% condition, and the approximately Normal condition. | III: D 1                           |
| 4   | Lesson 6.2     | • Use the Normal distribution to calculate probabilities regarding sample proportions.                                    | III: D 1                           |
| 5   | Quiz over Lesson 6.2 |                                                                                                                             |                                   |
| 6   | Lesson 6.3     | • Find the mean and standard deviation of the sampling distribution of a sample mean.
• Check the conditions needed for a sampling distribution of a sample mean including the random condition, the 10% condition, and the approximately Normal condition. | III: D 2                           |
| 7   | Lesson 6.3     | • Use the Normal distribution to calculate probabilities regarding sample means.                                                | III: D 2                           |
| 8   | Lesson 6.4     | • Utilize the central limit theorem to identify when a sampling distribution will be approximately Normal based on the shape of the population distribution and the size of the sample. | III: D 3                           |
| 9   | Quiz over Lessons 6.3 and 6.4 |                                                                                                                             |                                   |
| 10  | Unit Activity Unit Review | Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions. |                                   |
| 11  | Unit 6 Test    |                                                                                                                             |                                   |

## Unit 7 – Estimating with Confidence

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson</td>
<td>Course Topic Outline</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>----------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 1      | Lesson 7.1  
• Explain the idea of a confidence interval.  
• Recognize a confidence interval and determine what they represent.  
• Determine a point estimate from a sample and locate the point estimate in a confidence interval.  
IV: A 1, 2, 3 |
| 2      | Lesson 7.2  
• Determine the margin of error from a confidence interval.  
• Interpret a confidence interval in context.  
• Interpret a confidence level in context.  
• Explain how sample size and confidence level affect the length of an interval.  
IV: A 1, 2, 3 |
| 3      | Quiz over Lesson 7.1 and 7.2 |
| 4      | Lesson 7.3  
• State and check the conditions for constructing a confidence interval for a population proportion.  
  • Random Sample Condition  
  • 10% Condition  
  • Big Enough Condition  
• Determine the critical z values for calculating a confidence interval of any level.  
• Construct and interpret a confidence interval for a population proportion.  
IV: A 4 |
| 5      | Lesson 7.3  
• Determine the sample size required to build a confidence interval with a given margin of error  
IV: A 4 |
| 6      | Quiz over Lesson 7.3 |
| 7      | Lesson 7.4  
• State and check the conditions for constructing a confidence interval for a population mean.  
  • Random Sample Condition  
  • 10% Condition  
  • Big Enough Condition  
• Use a t-distribution in place of the standard Normal distribution and why it is necessary to use a t-distribution when finding a confidence interval for a population mean.  
• Determine the critical t values for calculating confidence intervals of any level.  
• Construct and interpret a confidence interval for a population mean.  
III: D 7  
IV: A 6 |
| 8      | Lesson 7.4  
• Determine the sample size required to build a confidence interval with a given margin of error.  
IV: A 6 |
| 9      | Quiz over Lesson 7.4 |
| 10     | Unit Activity Unit Review  
Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions.  
*Students will have an assignment where they must come up with a population proportion they would like to know. Then they will collect data to estimate that proportion. Then using that data they will estimate the population proportion with a confidence interval. The students will use the vocabulary of confidence intervals to describe methods, results, and interpretations in order to complete the assignment. |
| 11     | Unit 7 Test |

**Unit 8 – Significance Tests**

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Lesson 8.1  
• Understand the idea behind a significance test.  
• Create the null and alternative hypotheses for a significance test about a population parameter.  
IV: B 1 |
<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
</tr>
</thead>
</table>
| 2   | Lesson 8.2   | • Determine how to find a p-value  
• Interpret a p-value in context  
• Determine whether the results of a sample are statistically significant or not based on the p-value. | IV: B 1 |
| 3   | Quiz over Lesson 8.1 and 8.2 |                                                                                                                            | |
| 4   | Lesson 8.3   | • State and check the conditions for running a significance test about a population proportion.  
  ○ Random Sample Condition  
  ○ 10% Condition  
  ○ Big Enough Condition  
• Run a significance test about a population proportion. | IV: B 2 |
| 4   | Lesson 8.3   | • Analyze a confidence interval for a population proportion and see how they can help us make a conclusion for a test as well. | IV: B 2 |
| 5   | Quiz over Lesson 8.3 |                                                                                                                            | |
| 6   | Lesson 8.4   | • State and check the conditions for running a significance test about a population mean.  
  ○ Random Sample Condition  
  ○ 10% Condition  
  ○ Big Enough Condition  
• Run a significance test about a population mean. | IV: B 4 |
| 7   | Lesson 8.4   | • Analyze a confidence interval for a population mean and see how they can help us make a conclusion for a test as well. | IV: B 4 |
| 8   | Lesson 8.5   | • Run a significance test for the mean difference using paired data.                                                           | IV: B 5 |
| 9   | Quiz over Lesson 8.4 and 8.5 |                                                                                                                            | |
| 10  | Lesson 8.6   | • Explain and interpret type I and II error in context.  
• Interpret the power of a test and how it can be increased in a significance test.  
• Explain the relationship between type I error, type II error, and power. | IV: B 1 |
| 11  | Quiz over Lesson 8.6 |                                                                                                                            | |
| 12  | Unit Activity Unit Review | Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions. | |
| 13  | Unit 8 Test  |                                                                                                                            | |

**Unit 9 – Comparing Two Samples**

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lesson 9.1</td>
<td>• Describe the shape, center, and spread of the sampling distribution for the difference between two proportions.</td>
</tr>
<tr>
<td>2</td>
<td>Lesson 9.1</td>
<td>• Describe the shape, center, and spread of the sampling distribution for the difference between two means.</td>
</tr>
<tr>
<td>3</td>
<td>Lesson 9.2</td>
<td>• Build and interpret a confidence interval for the difference between two proportions.</td>
</tr>
<tr>
<td>4</td>
<td>Lesson 9.3</td>
<td>• Run a significance test to analyze if there is a true difference between two population proportions.</td>
</tr>
<tr>
<td>5</td>
<td>Quiz over Lesson 9.2 and 9.3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Lesson 9.4</td>
<td>• Build and interpret a confidence interval for the difference between two proportions.</td>
</tr>
<tr>
<td>7</td>
<td>Lesson 9.5</td>
<td>• Run a significance test to analyze if there is a true difference between two population means.</td>
</tr>
<tr>
<td>8</td>
<td>Quiz over Lessons 9.4 and 9.5</td>
<td></td>
</tr>
</tbody>
</table>
### Unit 10 – Inference for Categorical Data

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lesson 10.1</td>
<td>• Explain what a chi squared test is and what scenarios they are used for.</td>
<td>III: D 8 IV: B 6</td>
</tr>
</tbody>
</table>
| 2   | Lesson 10.2  | • State the null and alternative hypotheses for a chi squared test for goodness of fit.  
• Calculate the chi squared test statistic, degrees of freedom, and p-value for a chi squared test for goodness of fit. | IV: B 6                           |
| 3   | Lesson 10.2  | • Run a chi squared test for goodness of fit.              | IV: B 6                           |
| 4   | Quiz Over Lesson 10.1 and 10.2 |                                                           | IV: B 6                           |
| 5   | Lesson 10.3  | • State the null and alternative hypotheses for a chi squared test based on a two way table.  
• Compute expected outcomes for a two way table.  
• Calculate the chi squared test statistic, degrees of freedom, and p-value for a chi squared test based on a two way table.  
• Run a chi squared test for homogeneity. | IV: B 6                           |
| 6   | Lesson 10.3  | • Run a chi squared test for independence.                | IV: B 6                           |
| 7   | Quiz over Lesson 10.3 |                                               |                                   |
| 8   | Unit Activity Unit Review | Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions. |                                   |
| 9   | Unit 10 Test |                                                          |                                   |

### Unit 11 – Inference for Regression Lines

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives: The Students Will and complete assignments on:</th>
<th>AP Statistics Course Topic Outline</th>
</tr>
</thead>
</table>
| 1   | Lesson 11.1  | • Interpret the standard error for the slope of a regression line.  
• Construct a confidence interval for the true slope of a regression line between two quantitative variables. | IV: A 8                           |
| 2   | Quiz Over Confidence Intervals for Slope of a Regression Line |                                                           |                                   |
| 3   | Lesson 11.1  | • State the null and alternative hypothesis for a significance test to determine if there is a non-zero slope of a regression line between two quantitative variables.  
• Interpret the p-value for the slope from a computer output and make an appropriate conclusion about a non-zero slope. | IV: B 7                           |
| 4   | Lesson 11.1  | • Interpret the p-value for the slope from a computer output and make an appropriate conclusion about a non-zero slope. | IV: B 7                           |
| 5   | Unit Activity | Work on a unit review activity that will require students to bring together all aspects of the statistical processes learned in this unit, including design, analysis, and conclusions. |                                   |
| 6   | Unit 11 Test |                                                          |                                   |
Reviewing for the AP Test

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics</th>
<th>Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diagnostic Test</td>
<td>Students will take a diagnostic test to inform them where their strengths and weakness are in the course.</td>
</tr>
<tr>
<td>2</td>
<td>Theme 1 Review Exploring Data</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Theme 2 Review Linear Regression</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Theme 3 Review Sampling and Experimentation Design</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Theme 4 Review Probability</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Theme 5 Review Inference</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Review</td>
<td></td>
</tr>
</tbody>
</table>

Post AP Exam (approximately 15 days)

After the AP exam students will conduct a semester project.

Here is an example project:

The Project: Students will design and conduct an experiment to investigate the effects of response bias in surveys. They may choose the topic for their surveys, but they must design their experiment so that it can answer at least one of the following questions:

- Can the wording of a question create response bias?
- Do the characteristics of the interviewer create response bias?
- Does anonymity change the responses to sensitive questions?
- Does manipulating the answer choices change the response?

Develop a hypothesis that will enable the question you choose to study to be answered. For example, you might choose the second question and have two different interviewers (good-cop/bad-cop style) conduct the survey.

The project will be done in pairs. Students will turn in one project per pair. A written report must be typed (single-spaced, 12-point font), and included graphs should be done on the computer or on their calculator.

Proposal: The proposal should
- describe the topic and state which type of bias is being investigated;
- describe how to obtain subjects (minimum sample size is 50); and
- describe what questions will be used and how they will be asked, including how to incorporate direct control, blocking, and randomization.

Written Report: The written report should include a title in the form of a question and the following sections (clearly labeled):
- Introduction: What form of response bias was investigated? Why was the topic chosen for the survey? • Methodology: Describe how the experiment was conducted and justify why the design was effective. Note: This section should be very similar to the proposal.
- Results: Present the data in both tables and graphs in such a way that conclusions can be easily made. Make sure to label the graphs/tables clearly and consistently. Perform a hypothesis test on the data gathered and report conclusions based on statistical inference.
- Conclusions: What conclusions can be drawn from the experiment? Be specific. Were any problems encountered during the project? What could be done differently if the experiment were to be repeated? What was learned from this project?
- The original proposal.