



# **Advanced Placement® (AP®) Statistics (APSTATS) A Syllabus**

## **Course Name**

APSTATS A

Advanced Placement® (AP®) Statistics – Semester A

## **Course Information**

APSTATS A is the first semester of this two-semester course.

AP Statistics gives students hands-on experience in collecting, analyzing, graphing, and interpreting real-world data. They will learn to effectively design and analyze research studies by reviewing and evaluating real research examples taken from daily life. The next time they hear the results of a poll or study, they will know whether the results are valid. As the art of drawing conclusions from imperfect data and the science of real-world uncertainties, statistics play an important role in many fields. The equivalent of an introductory college-level course, AP Statistics prepares students for the AP exam and for further study in science, sociology, medicine, engineering, political science, geography, and business.

**Prerequisite:** Algebra II or Math Analysis

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## **Course Delivery Method**

Online

## **Contacting Your Instructor**

You may contact your instructor through the Blackboard messaging system. Technical support is available 24/7 at [www.k12.ttu.edu](http://www.k12.ttu.edu).

## Course Objectives

After completing this course, you should be able to:

1. collect, analyze, graph, and interpret real-world data;
2. effectively design and analyze research studies by reviewing and evaluating real research examples taken from daily life;
3. determine whether the results of a poll or study are valid; and
4. draw conclusions from imperfect data and the science of real-world uncertainties.

APSTATS addresses the required Texas Essential Knowledge and Skills (TEKS). These can be found at the [Texas Education Agency](#) website.

## Textbook and Materials

### *Textbook(s)*

There is no required text to purchase for this course.

### *Materials*

Required:

- TI-89, TI-84 Plus, TI-83, or TI-83 Plus calculator or equivalent

Optional:

- *Barron's AP Statistics*, 10th ed. Martin Sternstein (Barron's, 2019).  
ISBN-10: 1438011695 / ISBN-13: 9781438011691.  
Acceptable alternate: 9th ed. (2017). 1438009046 / ISBN-13: 9781438009049.  
Acceptable alternate: 8th ed. (2015). 1438004982 / ISBN-13: 9781438004983.  
Acceptable alternate: 7th ed. (2013). 1438002025 / ISBN-13: 9781438002026.
- *Introduction to Probability & Statistics*, 15th ed. William Mendenhall, Robert J. Beaver, and Barbara M. Beaver (Cengage, 2019).  
ISBN-10: 1337554421 / ISBN-13: 9781337554428.  
Acceptable alternate: 14th ed. (2015). ISBN-10: 1133103758.  
Acceptable alternate: 13th ed. (2009). ISBN-10: 0495389536.

## Technical Requirements

- Internet access – preferably high speed (for accessing Blackboard)
- Email
- Word processing software such as Microsoft Word
- Adobe Reader (download from [Adobe.com](#))
- Audio and video capabilities (for watching/listening to course content)
- PDF app (free options available)

## Technical Skill Requirements

Be comfortable with the following:

- using a word processor
- Internet search engines and browsers
- creating PDFs (see **Requirements for Creating PDFs** in the Syllabus section of your course)

## Coursework

The graded assignments within each unit are formative in nature. This means that they are designed to assist you in applying and demonstrating the unit concepts, as well as identifying areas in which you need additional review. You may use all the unit's learning activities to assist you as you complete the graded assignments.

## Submitting Assignments

You will submit all assignments through the Blackboard Assignment Tool, rather than by mail or email.

All course work will be completed in the Apex system (quizzes, discussions, practice assignments, journals, etc.). When submitting a Practice Assignment, you will submit it through the **Apex system > Messages > New Message** tool and choose your instructor. This will be the place where you upload file attachments showing your work on the assignment. Your instructor will receive the assignment submission and grade it, then provide feedback that will be sent back to you through Apex messages.

## Course Organization

This course consists of five units and a final exam. Each unit contains the following:

- Introduction and Instructions
- Learning Objectives and Curriculum Standards
- Learning Activities
- Assignments

Each unit includes several activities that present content knowledge. Each unit also includes multiple graded assignments to ensure that you learn the content that has been presented in the activities. Some of the assignments are automatically-graded quizzes, and some are written assignments or activities that your instructor will grade. Be sure you read all instructions carefully and ask your instructor for help if something is not clear.

## Course Outline

Please note that some assignments will be hidden from you when you start the course. As you move through the units and complete assignments, more will unlock for you.

Unit	Topic	Approximate Time for Completion
<b>Unit 1</b>	Describing Data	Four weeks
Lesson 1	What is Statistics?	
Lesson 2	Displaying Distributions with Graphs	
Lesson 3	Describing Distributions Using Numbers	
Lesson 4	Five-Number Summaries	
Lesson 5	More on Describing Distributions	
Lesson 6	Wrap-Up	
<b>Unit 2</b>	The Normal Distribution	Three weeks
Lesson 1	Introduction to the Normal Distribution	
Lesson 2	Standardized Scores	
Lesson 3	Determining if a Data Set is Normal	
Lesson 4	Wrap-Up	
<b>Unit 3</b>	Bivariate Data	Four weeks
Lesson 1	Introduction to Bivariate Data	
Lesson 2	The Least-Squares Regression Line	
Lesson 3	The Correlation Coefficient	
Lesson 4	Influential Points and Outliers	
Lesson 5	Transformations to Achieve Linearity	
Lesson 6	Categorical Bivariate Data: Two-Way Tables	
Lesson 7	Wrap-Up	
<b>Unit 4</b>	Planning a Study	Three weeks
Lesson 1	Methods of Data Collection — Experiments and Studies	
Lesson 2	Methods of Data Collection — Surveys	

<b>Unit</b>	<b>Topic</b>	<b>Approximate Time for Completion</b>
Lesson 3	Wrap-Up	
<b>Unit 5</b>	Probability	Three weeks
Lesson 1	What is Probability?	
Lesson 2	Introduction to the Basic Rules of Probability	
Lesson 3	More on Conditional Probabilities and the Probabilities of Combined Events	
Lesson 4	Probability Distributions	
Lesson 5	Means and Variances of Random Variables	
Lesson 6	Semester Wrap-Up	
<b>Final Exam</b>	Units 1-5	

## Assignment Schedule

Each of the following must be completed to complete the course. Items with an asterisk (\*) indicate that these are summative assessments for the course.

<b>Unit</b>	<b>Weeks</b>	<b>Assignments</b>
1	1-4	1.1.1 Discuss: Introductions 1.1.2 Discuss: Errors in Ads (and Other Claims) 1.1.5 Quiz: Types of Data, Types of Statistics 1.1.6 Practice: Identifying Types of Data and Statistics 1.2.1 Quiz: Variables and Distributions 1.2.2 Practice: What Can You Tell From Graphs? 1.2.3 Discuss: Choosing Appropriate Graphs 1.2.6 Quiz: Matching Graphs and Tables 1.2.8 Quiz: Stem-and-Leaf Plots 1.2.11 Discuss: Histograms 1.2.12 Quiz: Identifying Shapes of Distributions 1.3.3 Quiz: Populations, Samples, Parameters, Statistics 1.3.6 Practice: Differences Between Mean and Median 1.3.9 Practice: Standard Deviation and Variance 1.4.3 Quiz: Box-and-Whisker Plots and the Five-Number Summary 1.4.5 Practice: Working With Box-and-Whisker Plots 1.4.6 Discuss: Five-Number Summaries on MINITAB

<b>Unit</b>	<b>Weeks</b>	<b>Assignments</b>
		1.5.2 Quiz: Estimating Distribution Shape, Using Measures of Central Tendency 1.5.4 Practice: Distributions of Data 1.5.5 Quiz: Important Concepts From This Unit 1.6.1 Discuss: What Is Interesting? What Is Confusing? *1.6.3 Test (CS): Describing Data
<b>2</b>	5-7	2.1.1 Discuss: Performance Comparisons 2.2.5 Quiz: x-Values, z-Scores, and Areas on the Calculator 2.3.3 Quiz: Empirical Rule and Quantile Plots 2.3.4 Practice: Checking for Normalcy 2.3.5 Quiz: Aspects of the Normal Distribution 2.4.1 Discuss: What Is Interesting? What Is Confusing? *2.4.3 Test (CS): The Normal Distribution
<b>3</b>	8-11	3.1.1 Discuss: Shoe Size vs. Height 3.2.6 Practice: Linear Regression Lines 3.3.3 Discuss: Exploring Correlation Coefficient: r 3.3.11 Practice: Regression Lines and Bivariate Statistics 3.3.14 Discuss: Correlation vs. Causation 3.4.4 Quiz: Aspects of Linear Regression 3.5.3 Practice: Transformations to Achieve Linearity 3.6.1 Discuss: Comparing Groups in a Table 3.6.5 Discuss: A Paradox 3.6.6 Quiz: Simpson: Paradox and Confounding 3.7.1 Discuss: What Is Interesting? What Is Confusing? *3.7.3 Test (CS): Bivariate Data
<b>4</b>	12-14	4.1.3 Quiz: Data Collection 4.1.7 Quiz: Designs for Experiments 4.1.8 Practice: Choosing the Design of an Experiment 4.2.6 Quiz: Factors Causing Bias 4.2.7 Quiz: Aspects of Studies 4.3.1 Discuss: What Is Interesting? What Is Confusing? *4.3.3 Test (CS): Planning a Study
<b>5</b>	15-17	5.1.3 Discuss: What Do You Mean by That? 5.1.5 Quiz: Calculating Probabilities 5.2.3 Quiz: Basic Concepts of Probability 5.2.6 Practice: Using the Rules of Probability 5.3.5 Quiz: Calculating Conditional Probabilities Graphically 5.4.4 Quiz: Aspects of Random Variables 5.5.1 Discuss: Dice Games

<b>Unit</b>	<b>Weeks</b>	<b>Assignments</b>
		5.5.4 Practice: Computing Means and Variances 5.5.5 Quiz: Games and Real-World Problems 5.6.1 Discuss: What Is Interesting? What Is Confusing? *5.6.4 Exam: Semester Exam
		<b>*5.6.5 Final Exam: Semester Exam</b>

## Course Detailed Description

### **UNIT 1: DESCRIBING DATA**

#### **LESSON 1: WHAT IS STATISTICS?**

##### **1.1.1 Discuss: Introductions**

Introduce yourself to your classmates and your instructor.

*Duration: 15 mins; Scoring: 10 points*

##### **1.1.2 Discuss: Errors in Ads (and Other Claims)**

Discuss ads containing statistical errors, abuses, and misleading statements.

*Duration: 30 mins; Scoring: 10 points*

##### **1.1.3 Study: Welcome to Statistics**

Explore the history of statistics. Examine the main types of statistics and the types of data used in statistics.

*Duration: 50 mins*

##### **1.1.4 Practice: Welcome to Statistics**

Answer questions about the history of statistics, the main types of statistics and the types of data used in statistics.

*Duration: 30 mins*

##### **1.1.5 Quiz: Types of Data, Types of Statistics**

Answer questions on differentiating between counts vs. measures (that is, discrete vs. continuous data), numerical vs. categorical data, and inferential vs. descriptive statistics.

*Duration: 50 mins; Scoring: 10 points*

##### **1.1.6 Practice: Identifying Types of Data and Statistics**

Apply your knowledge to explain why a given study is descriptive or inferential and to identify categorical and numerical data.

*Duration: 1 hr; Scoring: 25 points*

### **LESSON 2: DISPLAYING DISTRIBUTIONS WITH GRAPHS**

#### **1.2.1 Quiz: Variables and Distributions**

Answer questions to familiarize yourself with statistical terms such as variable and distribution.

*Duration: 1 hr; Scoring: 10 points*

#### **1.2.2 Practice: What Can You Tell From Graphs?**

Use information from various kinds of graphs to answer questions.

*Duration: 1 hr; Scoring: 25 points*

#### **1.2.3 Discuss: Choosing Appropriate Graphs**

Discuss which type of graph is best for displaying a given data set and why.

*Duration: 30 mins; Scoring: 10 points*

#### **1.2.4 Study: Introduction to Frequency Data and Their Graphs**

Explore the different kinds of frequency plots, including histograms, relative frequency plots, cumulative frequency plots, cumulative relative frequency plots, and bar graphs.

*Duration: 50 mins*

#### **1.2.5 Practice: Introduction to Frequency Data and Their Graphs**

Answer questions about the different kinds of frequency plots, including histograms, relative frequency plots, cumulative frequency plots, cumulative relative frequency plots, and bar graphs.

*Duration: 30 mins*

#### **1.2.6 Quiz: Matching Graphs and Tables**

Answer questions based on tables and graphs. Match tables with graphs derived from the same data.

*Duration: 50 mins; Scoring: 10 points*

#### **1.2.7 Practice: Introduction to Stem-and-Leaf Plots**

Research stem-and-leaf plots and back-to-back stem-and-leaf plots. Practice creating them.

*Duration: 1 hr*

#### **1.2.8 Quiz: Stem-and-Leaf Plots**

Answer questions about stem-and-leaf plots.

*Duration: 50 mins; Scoring: 10 points*

#### **1.2.9 Study: Histograms, and Making Them on Your Graphing Calculator**

See how histograms are related to stem-and-leaf plots. Create histograms on your graphing calculator.

*Duration: 1 hr*

#### **1.2.10 Practice: Histograms, and Making Them on Your Graphing Calculator**

Answer questions about how histograms are related to stem-and-leaf plots and about histograms on your graphing calculator.

*Duration: 30 mins*

#### **1.2.11 Discuss: Histograms**

Discuss how best to display data with a histogram.

*Duration: 30 mins; Scoring: 10 points*

#### **1.2.12 Quiz: Identifying Shapes of Distributions**

Answer questions about uniformly distributed distributions, bimodal distributions, symmetric and mound-shaped distributions, distributions skewed to the left or to the right, clusters, gaps, and outliers.

*Duration: 1 hr; Scoring: 10 points*

### **LESSON 3: DESCRIBING DISTRIBUTIONS USING NUMBERS**

#### **1.3.1 Study: Populations and Samples, Parameters and Statistics**

Examine the distinction between a population and a sample, and between a parameter and a statistic. Go over the basics of random sampling.

*Duration: 50 mins*

#### **1.3.2 Practice: Populations and Samples, Parameters and Statistics**

Answer questions about the distinction between a population and a sample, and between a parameter and a statistic.

*Duration: 30 mins*

### **1.3.3 Quiz: Populations, Samples, Parameters, Statistics**

Answer questions about whether a given data set is a sample or a population and about whether a value is a statistic or a parameter.

*Duration: 40 mins; Scoring: 10 points*

### **1.3.4 Study: Measures of Central Tendency**

See how to calculate the three measures of center (the mean, the median, and the mode).

Explore the strengths and weaknesses of each.

*Duration: 50 mins*

### **1.3.5 Practice: Measures of Central Tendency**

Answer questions about how to calculate the three measures of center (the mean, the median, and the mode). Answer questions about the strengths and weaknesses of each.

*Duration: 30 mins*

### **1.3.6 Practice: Differences Between Mean and Median**

Calculate means and medians for different distributions (some with outliers), and answer questions about the differences between them.

*Duration: 1 hr 30 mins; Scoring: 25 points*

### **1.3.7 Study: Measuring Variation**

Explore a technique for measuring variation: the standard deviation. Go over the distinction between the population standard deviation and the sample standard deviation.

*Duration: 50 mins*

### **1.3.8 Practice: Measuring Variation**

Answer questions about a technique for measuring variation: the standard deviation, and the distinction between the population standard deviation and the sample standard deviation.

*Duration: 30 mins*

### **1.3.9 Practice: Standard Deviation and Variance**

Calculate standard deviations and variances.

*Duration: 1 hr 30 mins; Scoring: 25 points*

## **LESSON 4: FIVE-NUMBER SUMMARIES**

### **1.4.1 Study: Box-and-Whisker Plots and the Five-Number Summary**

Go over box-and-whisker plots and the five-number summary (minimum, Q1, median, Q3, and maximum). Learn the definition of outlier.

*Duration: 50 mins*

### **1.4.2 Practice: Box-and-Whisker Plots and the Five-Number Summary**

Answer questions about box-and-whisker plots and the five-number summary (minimum, Q1, median, Q3, and maximum). Learn the definition of outlier.

*Duration: 30 mins*

### **1.4.3 Quiz: Box-and-Whisker Plots and the Five-Number Summary**

Construct box-and-whisker plots and modified box-and-whisker plots. Answer questions about the minimum, Q1, median, Q3, maximum, and outliers.

*Duration: 50 mins; Scoring: 10 points*

### **1.4.4 Practice: Box-and-Whisker Plots and Modified Box-and-Whisker Plots for the Graphing Calculator**

See how to create a standard and modified box-and-whisker plots on a graphing calculator and interpret the results.

*Duration: 30 mins*

#### **1.4.5 Practice: Working With Box-and-Whisker Plots**

Create multiple box-and-whisker plots on your graphing calculator. Compare and contrast the distributions based on these plots.

*Duration: 1 hr 30 mins; Scoring: 25 points*

#### **1.4.6 Discuss: Five-Number Summaries on MINITAB**

Discuss distributions illuminated by related box-and-whisker plots and their MINITAB output. Learn how to read MINITAB output for five-number summaries and box-and-whisker plots.

*Duration: 30 mins; Scoring: 10 points*

### **LESSON 5: MORE ON DESCRIBING DISTRIBUTIONS**

#### **1.5.1 Practice: Averages in Skewed Data**

Graph skewed data on the TI-83 and calculate the mean and median. Repeat with a skewed left distribution.

*Duration: 30 mins*

#### **1.5.2 Quiz: Estimating Distribution Shape, Using Measures of Central Tendency**

Answer questions about how a sample can be used to estimate the shape of the distribution. See how to decide which measures of central tendency and variation are most appropriate to use with differently shaped distributions.

*Duration: 1 hr; Scoring: 10 points*

#### **1.5.3 Practice: Changes in Units of Measurement**

Explore changes in measures of center and spread resulting from changes in unit (using conversions between Celsius and Fahrenheit).

*Duration: 30 mins*

#### **1.5.4 Practice: Distributions of Data**

Bring together terms and symbols for characterizing a distribution, write about characteristics of different distributions in these terms, and offer theories about why the distributions are shaped as they are.

*Duration: 2 hrs; Scoring: 25 points*

#### **1.5.5 Quiz: Important Concepts From This Unit**

Answer questions to clarify your knowledge of some important concepts in statistics.

*Duration: 1 hr; Scoring: 15 points*

### **LESSON 6: WRAP-UP**

#### **1.6.1 Discuss: What Is Interesting? What Is Confusing?**

Discuss basic statistics, graphs, five-number summaries, distributions, and any concepts about which you are unclear.

*Duration: 30 mins; Scoring: 10 points*

#### **1.6.2 Review: Describing Data**

Review your studies of basic statistics, graphs, five-number summaries, and distributions.

*Duration: 3 hrs 30 mins*

#### **1.6.3 Test (CS): Describing Data**

Take a test about the basics of statistics.

*Duration: 20 mins; Scoring: 48 points*

*continued →*

## **UNIT 2: THE NORMAL DISTRIBUTION**

### **LESSON 1: INTRODUCTION TO THE NORMAL DISTRIBUTION**

#### **2.1.1 Discuss: Performance Comparisons**

Discuss performance comparisons between two unrelated distributions, such as scoring averages in baseball and basketball. Show distributions for scoring averages in two sports.

*Duration: 30 mins; Scoring: 10 points*

#### **2.1.2 Study: The Normal Curve**

Explore the characteristics and uses of one of the most important distributions in statistics: the bell-shaped (or normal) distribution.

*Duration: 50 mins*

#### **2.1.3 Practice: The Normal Curve**

Answer questions about the characteristics and uses of one of the most important distributions in statistics: the bell-shaped (or normal) distribution.

*Duration: 30 mins*

#### **2.1.4 Practice: Properties of Normal Distributions**

Manipulate graphs of normal curves and explore their properties. Change means and standard deviations to see the effect on the shape of the curve. Think of areas under the curve as proportions, relative frequencies, and probabilities.

*Duration: 1 hr*

#### **2.1.5 Practice: RandNorm() on a Graphing Calculator**

Use the RandNorm function on a graphing calculator to draw a sample. Store the data in a list, then create a histogram from the data and discuss whether the data appears “normal.”

*Duration: 30 mins*

## **LESSON 2: STANDARDIZED SCORES**

#### **2.2.1 Study: Raw and Standardized Scores**

Explore the standard normal distribution. See how to find areas in a normal distribution and in a standard normal distribution.

*Duration: 50 mins*

#### **2.2.2 Practice: Raw and Standardized Scores**

Answer questions about the standard normal distribution. See how to find areas in a normal distribution and in a standard normal distribution.

*Duration: 30 mins*

#### **2.2.3 Practice: x-Values and z-Scores**

Manipulate graphs of normal curves to find areas, proportions, and probabilities.

*Duration: 1 hr*

#### **2.2.4 Practice: Using a Normal Curve Table**

Translate raw scores to percentiles and areas (and vice versa) using a normal distribution table.

*Duration: 50 mins*

#### **2.2.5 Quiz: x-Values, z-Scores, and Areas on the Calculator**

Answer questions that require you to convert normal distribution scores using your graphing calculator.

*Duration: 50 mins; Scoring: 10 points*

## **LESSON 3: DETERMINING IF A DATA SET IS NORMAL**

### **2.3.1 Study: Checking a Data Set for Normalcy**

See how to check for normalcy using either the empirical rule or a normal quantile plot. Also, see how to use a graphing calculator to make a quantile plot.

*Duration: 50 mins*

### **2.3.2 Practice: Checking a Data Set for Normalcy**

Answer questions about how to check for normalcy using either the empirical rule or a normal quantile plot. Also, see how to use a graphing calculator to make a quantile plot.

*Duration: 30 mins*

### **2.3.3 Quiz: Empirical Rule and Quantile Plots**

Answer questions about testing a data set for normalcy using the empirical rule and normal quantile plots.

*Duration: 1 hr; Scoring: 15 points*

### **2.3.4 Practice: Checking for Normalcy**

Use the empirical rule to determine if a given data set is normal. Use a graphing calculator to do a normal quantile plot, and decide if it is close to a normal distribution.

*Duration: 1 hr; Scoring: 25 points*

### **2.3.5 Quiz: Aspects of the Normal Distribution**

Answer questions about terms and properties associated with the normal distribution.

*Duration: 50 mins; Scoring: 20 points*

## **LESSON 4: WRAP-UP**

### **2.4.1 Discuss: What Is Interesting? What Is Confusing?**

Discuss the normal distribution, and any concepts about which you are unclear.

*Duration: 30 mins; Scoring: 10 points*

### **2.4.2 Review: The Normal Distribution**

Review your studies of the normal distribution.

*Duration: 3 hrs 30 mins*

### **2.4.3 Test (CS): The Normal Distribution**

Take a test about the normal distribution.

*Duration: 20 mins; Scoring: 48 points*

## **UNIT 3: BIVARIATE DATA**

## **LESSON 1: INTRODUCTION TO BIVARIATE DATA**

### **3.1.1 Discuss: Shoe Size vs. Height**

Using data provided, plot shoe size and height to see if there's a pattern. Discuss your findings.

*Duration: 30 mins; Scoring: 10 points*

### **3.1.2 Practice: Scatterplots and Bivariate Data**

Go over the distinction between categorical and quantitative variables. Create scatterplots and explore the distinction between the explanatory variable and the response variable.

*Duration: 30 mins*

## **LESSON 2: THE LEAST-SQUARES REGRESSION LINE**

### **3.2.1 Study: Least-Squares Regression Line**

Explore the least-squares regression line (a model for data that may be linearly associated).

*Duration: 50 mins*

### **3.2.2 Practice: Least-Squares Regression Line**

Answer questions about the least-squares regression line (a model for data that may be linearly associated).

*Duration: 30 mins*

### **3.2.3 Practice: Exploring LSR With a Graphing Calculator**

Use a graphing calculator to explore the meaning of the least-squares regression and find lines of best fit. Learn about residuals and how to calculate them on your graphing calculator.

*Duration: 50 mins*

### **3.2.4 Study: Residuals**

Explore residuals in linear regression and see how to compute them with a graphing calculator.

*Duration: 50 mins*

### **3.2.5 Practice: Residuals**

Answer questions about residuals in linear regression and see how to compute them with a graphing calculator.

*Duration: 30 mins*

### **3.2.6 Practice: Linear Regression Lines**

Given bivariate data, produce a scatterplot and produce a linear regression line and its residual plot by using a graphing calculator. Explain why a line is or is not a good model for the given data.

*Duration: 50 mins; Scoring: 25 points*

## **LESSON 3: THE CORRELATION COEFFICIENT**

### **3.3.1 Study: Pearson: Correlation Coefficient**

Explore Pearson's correlation coefficient. See what scatterplots look like for various r's, and see how to obtain r on a graphing calculator. Examine the relationship between r and the slope of the regression line.

*Duration: 50 mins*

### **3.3.2 Practice: Pearson: Correlation Coefficient**

Answer questions about Pearson's correlation coefficient. See what scatterplots look like for various r's, and see how to obtain r on a graphing calculator. Examine the relationship between r and the slope of the regression line.

*Duration: 30 mins*

### **3.3.3 Discuss: Exploring Correlation Coefficient: r**

Use your graphing calculator to explore correlation coefficients for different distributions. Move, create, and delete points to see the effects on Pearson's r. Discuss your findings.

*Duration: 30 mins; Scoring: 10 points*

### **3.3.4 Practice: r on Your Graphing Calculator**

Given some bivariate real-world data, use your graphing calculator's STAT functions to find the linear regression line and the correlation coefficient r.

*Duration: 30 mins*

### **3.3.5 Study: The Meaning of r-Squared**

Explore r-squared (also called the coefficient of determination), which gives the proportion of the variation in a response variable that is explained by the explanatory variable.

*Duration: 50 mins*

### **3.3.6 Practice: The Meaning of r-Squared**

Answer questions about r-squared (also called the coefficient of determination), which gives the proportion of the variation in a response variable that is explained by the explanatory variable.

*Duration: 30 mins*

### **3.3.7 Practice: Finding and Interpreting r and r-Squared**

Given some real-world bivariate data, use your graphing calculator's STAT functions to find the linear regression line, r, and r-squared. Explain the meaning of r, -squared, and the slope of the regression line in the context of each problem.

*Duration: 1 hr*

### **3.3.8 Study: Uses of the Regression Line**

Explore correlation, residual plots, and linear regression predictions. Examine the distinction between interpolation and extrapolation.

*Duration: 50 mins*

### **3.3.9 Practice: Uses of the Regression Line**

Answer questions about correlation, residual plots, and linear regression predictions. Examine the distinction between interpolation and extrapolation.

*Duration: 30 mins*

### **3.3.10 Practice: Relation of Shoe Size to Height**

Determine whether the correlation is strong for a data set. Calculate the r and find the linear regression line—. Determine whether there is evidence that the variables are related.

*Duration: 30 mins*

### **3.3.11 Practice: Regression Lines and Bivariate Statistics**

Given real-world bivariate data, use your graphing calculator's STAT functions to find the linear regression line and its slope. Explain and interpret the meaning of the slope (the regression coefficient). Explain the meaning of r and r-squared.

*Duration: 2 hrs; Scoring: 25 points*

### **3.3.12 Study: How to Read MINITAB Output**

See how to read MINITAB output for scatterplots, linear regression lines, correlation coefficients and r-squared, residual plots, and other bivariate statistics.

*Duration: 50 mins*

### **3.3.13 Practice: How to Read MINITAB Output**

Answer questions about how to read MINITAB output for scatterplots, linear regression lines, correlation coefficients and r-squared, residual plots, and other bivariate statistics.

*Duration: 30 mins*

### **3.3.14 Discuss: Correlation vs. Causation**

Consider bivariate data sets (along with stories about how the data sets were gathered) and discuss whether the data sets may or may not show a cause-and-effect relationship.

*Duration: 30 mins; Scoring: 10 points*

## **LESSON 4: INFLUENTIAL POINTS AND OUTLIERS**

### **3.4.1 Study: Influential Points and Outliers**

Explore the effects of outliers and influential points on a linear regression.

*Duration: 50 mins*

### **3.4.2 Practice: Influential Points and Outliers**

Answer questions about the effects of outliers and influential points on a linear regression.

*Duration: 30 mins*

### **3.4.3 Practice: Bivariate Statistics and Outliers**

Use your graphing calculator to explore the effects of outliers on the least-squares line regression and on the correlation coefficient. Then use your graphing calculator to explore a set of bivariate data.

*Duration: 1 hr*

#### **3.4.4 Quiz: Aspects of Linear Regression**

Answer questions about scatterplots, variables, linear regression, residuals, r, r-squared, outliers, influential points, interpolation, and extrapolation.

*Duration: 50 mins; Scoring: 15 points*

### **LESSON 5: TRANSFORMATIONS TO ACHIEVE LINEARITY**

#### **3.5.1 Study: Transformations to Achieve Linearity**

Explore data sets that are not linearly associated, and see how to transform the data in such sets to achieve linear association.

*Duration: 50 mins*

#### **3.5.2 Practice: Transformations to Achieve Linearity**

Answer questions about data sets that are not linearly associated, and see how to transform the data in such sets to achieve linear association.

*Duration: 30 mins*

#### **3.5.3 Practice: Transformations to Achieve Linearity**

Use the graphing calculator's STAT functions to practice the methods to straighten exponential, power, and logarithmic associations.

*Duration: 1 hr 30 mins; Scoring: 25 points*

#### **3.5.4 Practice: Straightening Relationships**

Practice regression techniques.

*Duration: 1 hr*

### **LESSON 6: CATEGORICAL BIVARIATE DATA: TWO-WAY TABLES**

#### **3.6.1 Discuss: Comparing Groups in a Table**

Discuss questions such as the following: Does a sports team perform better at home or away? Is there a relationship between education and military service?

*Duration: 30 mins; Scoring: 10 points*

#### **3.6.2 Study: How to Interpret a Two-Way Table**

Examine marginal frequencies, row and column percents, and conditional distributions.

*Duration: 50 mins*

#### **3.6.3 Practice: How to Interpret a Two-Way Table**

Answer questions about marginal frequencies, row and column percents, and conditional distributions.

*Duration: 30 mins*

#### **3.6.4 Practice: Creating Two-Way Tables**

Use a data set to create a two-way table with row and column percents. Create joint frequencies and marginal frequencies and answer questions about the conclusions you can draw.

*Duration: 1 hr*

#### **3.6.5 Discuss: A Paradox**

Discuss how strange things can happen when data or statistics are combined.

*Duration: 30 mins; Scoring: 10 points*

#### **3.6.6 Quiz: Simpson: Paradox and Confounding**

Answer questions about Simpson's paradox.

*Duration: 50 mins; Scoring: 10 points*

## **LESSON 7: WRAP-UP**

### **3.7.1 Discuss: What Is Interesting? What Is Confusing?**

Discuss bivariate data, the least-squares regression line, the correlation coefficient, influential points and outliers, categorical bivariate data, two-way tables, and any concepts about which you are unclear.

*Duration: 30 mins; Scoring: 10 points*

### **3.7.2 Review: Bivariate Data: Regression Analysis and Two-Way Tables**

Review your studies of bivariate data.

*Duration: 3 hrs 30 mins*

### **3.7.3 Test (CS): Bivariate Data**

Take a test about bivariate data.

*Duration: 20 mins; Scoring: 48 points*

## **UNIT 4: PLANNING A STUDY**

### **LESSON 1: METHODS OF DATA COLLECTION--EXPERIMENTS AND STUDIES**

#### **4.1.1 Study: Vocabulary of Data Collection**

Explore data-collection terms and concepts such as sample, census, anecdotal evidence, available data, design for producing data, and observational study vs. experiment.

*Duration: 50 mins*

#### **4.1.2 Practice: Vocabulary of Data Collection**

Explore data-collection terms and concepts such as sample, census, anecdotal evidence, available data, design for producing data, and observational study vs. experiment.

*Duration: 30 mins*

#### **4.1.3 Quiz: Data Collection**

Answer questions about methods of data collection and state whether they will yield valid results. Differentiate between an observational study and an experiment.

*Duration: 1 hr; Scoring: 10 points*

#### **4.1.4 Study: Vocabulary of Experiments and Surveys**

Explore experiment terminology and the three principles of experimental design.

*Duration: 50 mins*

#### **4.1.5 Practice: Vocabulary of Experiments and Surveys**

Explore experiment terminology and the three principles of experimental design.

*Duration: 30 mins*

#### **4.1.6 Practice: Aspects of Experiments**

Given an experimental design, identify terms associated with experiments. Identify elements of effective and flawed design.

*Duration: 50 mins*

#### **4.1.7 Quiz: Designs for Experiments**

Answer questions about completely randomized design vs. randomized match-paired design vs. randomized block design.

*Duration: 1 hr 30 mins; Scoring: 10 points*

#### **4.1.8 Practice: Choosing the Design of an Experiment**

Design an experiment to test a given researchable issue.

*Duration: 1 hr 30 mins; Scoring: 25 points*

## **LESSON 2: METHODS OF DATA COLLECTION--SURVEYS**

### **4.2.1 Study: Types of Samples for Surveys**

Explore the types of samples for surveys, including: simple random sample, census, stratified random sample, convenience sample, systematic sample and cluster sample, representative sample as opposed to a random sample, and self-selected sample.

*Duration: 50 mins*

### **4.2.2 Practice: Types of Samples for Surveys**

Explore the types of samples for surveys, including: simple random sample, census, stratified random sample, convenience sample, systematic sample and cluster sample, representative sample as opposed to a random sample, and self-selected sample.

*Duration: 30 mins*

### **4.2.3 Practice: Generating Random Samples**

Using the random number generator on a graphing calculator, randomly allocate subjects to two or more groups, so that the groups have equal size or their placement is independent.

*Duration: 50 mins*

### **4.2.4 Study: Bias in Surveys/Transition to Inference**

Explore the types of bias in surveys, including the following: under-coverage, non-response, response bias, voluntary response, wording of a question, order of questions, and sampling bias.

*Duration: 1 hr*

### **4.2.5 Practice: Bias in Surveys/Transition to Inference**

Explore the types of bias in surveys, including the following: under-coverage, non-response, response bias, voluntary response, wording of a question, order of questions, and sampling bias.

*Duration: 30 mins*

### **4.2.6 Quiz: Factors Causing Bias**

Answer questions about the various causes of bias in observational studies and experiments.

*Duration: 1 hr; Scoring: 10 points*

### **4.2.7 Quiz: Aspects of Studies**

Answer questions about terms related to experimental and observational studies.

*Duration: 1 hr; Scoring: 10 points*

## **LESSON 3: WRAP-UP**

### **4.3.1 Discuss: What Is Interesting? What Is Confusing?**

Discuss methods of data collection, including experiments, studies, and surveys, and any concepts about which you are unclear.

*Duration: 30 mins; Scoring: 10 points*

### **4.3.2 Review: Planning a Study**

Review your studies of methods of data collection.

*Duration: 3 hrs 30 mins*

### **4.3.3 Test (CS): Planning a Study**

Take a test about methods of data collection.

*Duration: 20 mins; Scoring: 48 points*

*continued →*

## **UNIT 5: PROBABILITY**

### **LESSON 1: WHAT IS PROBABILITY?**

#### **5.1.1 Study: Range of Probabilities**

See that the range of probabilities is between 0 and 1, and that probabilities can be estimated from past events, from the theoretical definition of probability (equally likely outcomes), or from an intuition based on previous experience.

*Duration: 50 mins*

#### **5.1.2 Practice: Range of Probabilities**

See that the range of probabilities is between 0 and 1, and that probabilities can be estimated from past events, from the theoretical definition of probability (equally likely outcomes), or from an intuition based on previous experience.

*Duration: 30 mins*

#### **5.1.3 Discuss: What Do You Mean by That?**

Discuss which words denote what probabilities. Associate words like might, maybe, certain, probably, possibly, unlikely, and very likely with a single probability or a range of probabilities from 0 to 1.

*Duration: 30 mins; Scoring: 10 points*

#### **5.1.4 Practice: What Is Probability?**

Consider probability in terms of relative frequencies. Look at examples and answer questions.

*Duration: 30 mins*

#### **5.1.5 Quiz: Calculating Probabilities**

Answer questions that require you to calculate probabilities from a given data set.

*Duration: 50 mins; Scoring: 10 points*

### **LESSON 2: INTRODUCTION TO THE BASIC RULES OF PROBABILITY**

#### **5.2.1 Study: Concepts of Probability**

Explore basic concepts of probability, such as sample space, outcome, and event.

*Duration: 50 mins*

#### **5.2.2 Practice: Concepts of Probability**

Explore basic concepts of probability, such as sample space, outcome, and event.

*Duration: 30 mins*

#### **5.2.3 Quiz: Basic Concepts of Probability**

Answer questions about the basic concepts of probability.

*Duration: 1 hr; Scoring: 10 points*

#### **5.2.4 Study: The Rules of Probability and an Introduction to Conditional Probability**

Explore conditional probability, and learn some rules for solving probability problems.

*Duration: 50 mins*

#### **5.2.5 Practice: The Rules of Probability and an Introduction to Conditional Probability**

Explore conditional probability, and learn some rules for solving probability problems.

*Duration: 30 mins*

#### **5.2.6 Practice: Using the Rules of Probability**

Apply the rules for calculating conditional probabilities and the probabilities of combined events.

*Duration: 1 hr 30 mins; Scoring: 25 points*

## **LESSON 3: MORE ON CONDITIONAL PROBABILITIES AND THE PROBABILITIES OF COMBINED EVENTS**

### **5.3.1 Practice: Practice With Laws of Probability**

Apply probability laws.

*Duration: 1 hr*

### **5.3.2 Study: Conditional Probabilities and Tree Diagrams**

Explore conditional and combined probability using tree diagrams and two-way tables.

*Duration: 50 mins*

### **5.3.3 Practice: Conditional Probabilities and Tree Diagrams**

Explore conditional and combined probability using tree diagrams and two-way tables.

*Duration: 30 mins*

### **5.3.4 Practice: Tree Diagrams and Probabilities**

Use tree diagrams to find probabilities.

*Duration: 1 hr*

### **5.3.5 Quiz: Calculating Conditional Probabilities Graphically**

Answer questions about conditional probability using tree-diagrams or two-way tables.

*Duration: 1 hr; Scoring: 10 points*

## **LESSON 4: PROBABILITY DISTRIBUTIONS**

### **5.4.1 Study: Random Variables: Discrete and Continuous**

Explore random variables. Consider discrete vs. continuous random variables, and see how they're used in probability. Examine probability distributions for random variables, density curves, and see why  $P(x) = 0$  for any individual number.

*Duration: 50 mins*

### **5.4.2 Practice: Random Variables: Discrete and Continuous**

Explore random variables. Consider discrete vs. continuous random variables, and see how they're used in probability. Examine probability distributions for random variables, density curves, and see why  $P(x) = 0$  for any individual number.

*Duration: 30 mins*

### **5.4.3 Practice: Discrete Probability Distributions**

Use your graphing calculator to do virtual random experiments (such as die rolls, coin flips, and candy samples) and see their histograms. Convert probability tables into histograms and vice versa. Create probability histograms from given facts.

*Duration: 1 hr*

### **5.4.4 Quiz: Aspects of Random Variables**

Answer questions about discrete random variables, continuous random variables, density curves, probability distributions, and probability histograms.

*Duration: 50 mins; Scoring: 15 points*

## **LESSON 5: MEANS AND VARIANCES OF RANDOM VARIABLES**

### **5.5.1 Discuss: Dice Games**

Given the rules of various dice games, rank them by which you'd prefer to play (from a statistical point of view). Discuss your ranking.

*Duration: 30 mins; Scoring: 10 points*

### **5.5.2 Study: Mean and Variances of Random Variables**

Go over expected value or expectation. Examine the rules for means and the effect of an  $a + bx$  transformation. Look at the rules for variances (and standard deviations).

*Duration: 50 mins*

### **5.5.3 Practice: Mean and Variances of Random Variables**

Go over expected value or expectation. Examine the rules for means and the effect of an  $a + bx$  transformation. Look at the rules for variances (and standard deviations).

*Duration: 30 mins*

### **5.5.4 Practice: Computing Means and Variances**

Apply your knowledge of how to compute means and variances.

*Duration: 1 hr; Scoring: 25 points*

### **5.5.5 Quiz: Games and Real-World Problems**

Answer questions that require you to apply probability rules to problems and games.

*Duration: 50 mins; Scoring: 10 points*

## **LESSON 6: SEMESTER WRAP-UP**

### **5.6.1 Discuss: What Is Interesting? What Is Confusing?**

Discuss probability, including conditional probabilities, probabilities of combined events, probability distributions, and means and variances of random variables, and any concepts about which you are unsure.

*Duration: 30 mins; Scoring: 10 points*

### **5.6.2 Review: Probability Review**

Review your studies of probability.

*Duration: 3 hrs 30 mins*

### **5.6.3 Review: Semester 1 Review**

Review your studies of basic statistics.

*Duration: 4 hrs*

### **5.6.4 Exam: Semester Exam**

Take a test about basic statistics.

*Duration: 55 mins; Scoring: 100 points*

### **5.6.5 Final Exam: Semester Exam**

Take a test about basic statistics.

*Duration: 55 mins; Scoring: 100 points*

## **Course Credit**

The course grade will be calculated as follows:

- 50% coursework average;
- 50% summative assessment average, including the final exam;
- A passing course grade is 70 or higher.

Students must attempt all assignments in the course. The final exam will not be available until all assignments have been accepted and graded by the teacher.

Students who score below 70% on the final exam will be eligible for one re-exam opportunity.

## **Summative Assessments**

Summative assessments are those that allow you to demonstrate mastery of the course objectives. For summative assessments, you will NOT be allowed to use the learning materials. These are opportunities for you to show what you have learned by that point in the course. The summative assessments for this course are as follows:

- Unit Tests (**20% of Course Grade**)
- Final Exam (**30% of Course Grade**)

## **Course Completion**

- Students may not complete the course in less than 30 days.
- All courses expire six months after the enrollment date.

## **Academic Integrity**

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

“Scholastic dishonesty” includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

## **Student Expectations**

You will be expected to log into the Blackboard course regularly to be aware of possible announcements/reminders and to pace your progress in the course.

Students are expected to maintain an online environment conducive to learning, which includes “netiquette” (Internet etiquette). Please review the basic rules for [Online Discussion Netiquette](#). Ensure that your email messages, discussion board postings, and other electronic communications are thoughtful and respectful. Diverse opinions are welcome in this course, and you are expected to demonstrate an open mind and courtesy when responding to the thoughts and ideas of others.

The following are prohibited:

- making offensive remarks in email or the discussion board;
- using inappropriate language or discussing inappropriate topics online;
- spamming;
- hacking;
- using TTU or Blackboard email or discussion boards for commercial purposes;

- using all caps (considered shouting in online communications); and
- cyber-bullying or online harassment of any type.

Inappropriate behavior shall result in consequences ranging from a request to correct the problem, to removal from the course or even the university, depending on the severity of the behavior. Disciplinary actions will be taken according to the TTU K-12 Student Handbook.

## Communication

- You can expect a reply from your instructor within 2 business days.
- Use the Blackboard Course Messages tool for sending messages to your instructor.
- Apex Messages will be used for submitting assignments that your instructor must grade.

## Technical Difficulties

### ***Getting Help***

For student assistance with Blackboard, visit [TTU K-12 Support](#).

### ***Computer Problems***

A working computer is necessary for online coursework. Computer problems will not be accepted as a valid reason for failure to complete course activities within the allotted time frame. Identify a second computer, before the course begins, that you can use if you experience computer problems.

### ***Server Problems***

When the Blackboard server needs to be taken down for maintenance, the Blackboard administrator will post an announcement in your course informing you of the time and date. If the server experiences unforeseen problems, your course instructor will notify you.

### ***Lost or Corrupted Files***

You must keep/save a copy of every project/assignment on an external disk or personal computer. In the event of any kind of technology failure (e.g., Blackboard server crash or virus infection, students' own computer problems, loss of files in cyberspace, etc.) or any disputes, the instructor may request or require you to resubmit the files. In some instances, the instructor may need to open another attempt within Blackboard, so communication with your instructor is critical in these circumstances.