

AP STATISTICS – H

PREREQUISITE:

Successful completion of Pre-Calculus–H *OR* AP Calculus–H *OR* B- or better in Pre-Calculus –A.

CREDIT: 1 credit

The topics for Honors Statistics will be divided into four major themes that are covered by the AP Statistics Course: exploratory analysis (20–30 percent of the exam), planning and conducting a study (10–15 percent of the exam), probability (20–30 percent of the exam), and statistical inference (30–40 percent of the exam). This is a full year course designed to prepare students to take the AP Statistics Exam.

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- I. Exploratory Analysis:** 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.
- II. Planning and Conducting a Study:** 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.
- III. 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.
- IV. 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.

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

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

- A. Constructing and interpreting graphical displays of distributions of univariate data (dot plot, stem plot, histogram, cumulative frequency plot)
 - 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 (dot plots, back-to-back stem plots, 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

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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: Planning and conducting a study (10%–15%)**

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

- A. Overview of methods of data collection
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

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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: Exploring random phenomena using probability and simulation (20%–30%)

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

- A. Probability
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

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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: Estimating population parameters and testing hypotheses (30%–40%)

Statistical inference guides the selection of appropriate models.

- A. Estimation (point estimators and confidence intervals)
1. Estimating population parameters and margins of error
 2. Properties of point estimators, including unbiasedness and variability

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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

Waterford High School AP Statistics Syllabus

COURSE DESCRIPTION:

AP Statistics is the high school equivalent of a one semester, introductory college statistics course. In this course, students develop strategies for collecting, organizing, analyzing, and drawing conclusions from data. Students design, administer, and tabulate results from surveys and experiments. Probability and simulations aid students in constructing models for chance behavior. Sampling distributions provide the logical structure for confidence intervals and hypothesis tests. Students use a TI-83/84 graphing calculator, and Web-based java applets to investigate statistical concepts. To develop effective statistical communication skills, students are required to prepare frequent written and oral analyses of real data.

COURSE GOALS:

In AP Statistics, students are expected to learn

Skills

- To produce convincing oral and written statistical arguments, using appropriate terminology, in a variety of applied settings.
- When and how to use technology to aid them in solving statistical problems

Knowledge

- Essential techniques for producing data (surveys, experiments, observational studies), analyzing data (graphical & numerical summaries), modeling data (probability, random variables, sampling distributions), and drawing conclusions from data (inference procedures – confidence intervals and significance tests)

Habits of mind

- To become critical consumers of published statistical results by heightening their awareness of ways in which statistics can be improperly used to mislead, confuse, or distort the truth.

COURSE OUTLINE:

Text: The Practice of Statistics (5th edition), by Starnes, Tabor, Yates, and Moore, W. H. Freeman & Co., 2014.

Chapter 4

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	4.1 Introduction, The Idea of a Sample Survey, How to Sample Badly, How to Sample Well: Simple Random Sampling	<ul style="list-style-type: none"> Identify the population and sample in a statistical study. Identify voluntary response samples and convenience samples. Explain how these sampling methods can lead to bias. Describe how to obtain a random sample using slips of paper, technology, or a table of random digits. Complete the Federalist Papers Activity 	1, 3, 5, 7, 9, 11
2	4.1 Other Random Sampling Methods	<ul style="list-style-type: none"> Distinguish a simple random sample from a stratified random sample or cluster sample. Give the advantages and disadvantages of each sampling method. Complete the Rolling Down the River Activity <i>Looks at differences between SRS and Stratified Sampling</i> 	13, 17, 19, 21, 23, 25
3	4.1 Inference for Sampling, Sample Surveys: What Can Go Wrong?	<ul style="list-style-type: none"> Explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias. 	27, 29, 31, 33, 35
4	4.2 Observational Study versus Experiment, The Language of Experiments	<ul style="list-style-type: none"> Distinguish between an observational study and an experiment. Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions. 	37–42, 45, 47, 49, 51, 53, 55
5	4.2 How to Experiment Badly, How to Experiment Well, Completely Randomized Designs	<ul style="list-style-type: none"> Identify the experimental units, explanatory and response variables, and treatments. Explain the purpose of comparison, random assignment, control, and replication in an experiment. Describe a completely randomized design for an experiment, including how to randomly assign treatments using slips of paper, technology, or a table of random digits. 	57, 59, 61, 63, 65
6	4.2 Experiments: What Can Go Wrong? Inference for Experiments	<ul style="list-style-type: none"> Describe the placebo effect and the purpose of blinding in an experiment. Interpret the meaning of statistically significant in the context of an experiment. Complete Distracted Driving Activity 	67, 69, 71, 73
7	4.2 Blocking	<ul style="list-style-type: none"> Explain the purpose of blocking in an experiment. Describe a randomized block design or a matched pairs design for an experiment. Complete the Standing/Standing Pulse Rates Activity 	75, 77, 79, 81, 85
8	4.3 Scope of Inference, The Challenges of Establishing Causation	<ul style="list-style-type: none"> Describe the scope of inference that is appropriate in a statistical study. 	83, 87–94, 97–104
9	4.3 Data Ethics (optional topic)	<ul style="list-style-type: none"> Evaluate whether a statistical study has been carried out in an ethical manner. 	Chapter 4 Review Exercises
10	Chapter 4 Review/FRAPPY!		Chapter 4 AP [®] Practice Exam
11	Chapter 4 Test		Cumulative AP Practice Test 1

Chapter 1

Day	Topics	Learning Objectives Students will be able to ...	Suggested assignment
1	Chapter 1 Introduction	<ul style="list-style-type: none"> Identify the individuals and variables in a set of data. Classify variables as categorical or quantitative. 	1, 3, 5, 7, 8
2	1.1 Bar Graphs and Pie Charts, Graphs: Good and Bad	<ul style="list-style-type: none"> Display categorical data with a bar graph. Decide if it would be appropriate to make a pie chart. Identify what makes some graphs of categorical data deceptive. 	11, 13, 15, 17
3	1.1 Two-Way Tables and Marginal Distributions, Relationships between Categorical Variables: Conditional Distributions	<ul style="list-style-type: none"> Calculate and display the marginal distribution of a categorical variable from a two-way table. Calculate and display the conditional distribution of a categorical variable for a particular value of the other categorical variable in a two-way table. Describe the association between two categorical variables by comparing appropriate conditional distributions. 	19, 21, 23, 25, 27–32
4	1.2 Dotplots, Describing Shape, Comparing Distributions, Stemplots	<ul style="list-style-type: none"> Make and interpret dotplots and stemplots of quantitative data. Describe the overall pattern (shape, center, and spread) of a distribution and identify any major departures from the pattern (outliers). Identify the shape of a distribution from a graph as roughly symmetric or skewed. Compare distributions of quantitative data using dotplots or stemplots. 	37, 39, 41, 43, 45, 47
5	1.2 Histograms, Using Histograms Wisely	<ul style="list-style-type: none"> Make and interpret histograms of quantitative data. Compare distributions of quantitative data using histograms. 	53, 55, 59, 60, 65, 69–74
6	1.3 Measuring Center: Mean and Median, Comparing the Mean and Median, Measuring Spread: Range and <i>IQR</i> , Identifying Outliers, Five-Number Summary and Boxplots	<ul style="list-style-type: none"> Calculate measures of center (mean, median). Calculate and interpret measures of spread (range, <i>IQR</i>). Choose the most appropriate measure of center and spread in a given setting. Identify outliers using the $1.5 \times IQR$ rule. Make and interpret boxplots of quantitative data. 	79, 81, 83, 87, 89, 91, 93
7	1.3 Measuring Spread: Standard Deviation, Choosing Measures of Center and Spread, Organizing a Statistics Problem	<ul style="list-style-type: none"> Calculate and interpret measures of spread (standard deviation). Choose the most appropriate measure of center and spread in a given setting. Use appropriate graphs and numerical summaries to compare distributions of quantitative variables. RossmannChance applet on selecting median vs. mean 	95, 97, 99, 103, 105, 107–110
8	Chapter 1 Review/FRAPPY!		Chapter 1 Review Exercises
9	Chapter 1 Test		

Chapter 1/4 Project: Students work in teams of 2 to design and carry out an experiment to investigate response bias, write a summary report, and give a 10 minute oral synopsis to their classmates. *See rubric on page 14.*

Chapter 2

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	2.1 Measuring Position: Percentiles; Cumulative Relative Frequency Graphs; Measuring Position: z-scores	<ul style="list-style-type: none"> Find and interpret the percentile of an individual value within a distribution of data. Estimate percentiles and individual values using a cumulative relative frequency graph. Find and interpret the standardized score (z-score) of an individual value within a distribution of data. Activity: Where do I stand? 	1, 3, 5, 9, 11, 13, 15
2	2.1 Transforming Data	<ul style="list-style-type: none"> Describe the effect of adding, subtracting, multiplying by, or dividing by a constant on the shape, center, and spread of a distribution of data. 	17, 19, 21, 23, 25–30
3	2.2 Density Curves, The 68–95–99.7 Rule; The Standard Normal Distribution	<ul style="list-style-type: none"> Estimate the relative locations of the median and mean on a density curve. Use the 68–95–99.7 rule to estimate areas (proportions of values) in a Normal distribution. Use Table A or technology to find (i) the proportion of z-values in a specified interval, or (ii) a z-score from a percentile in the standard Normal distribution. Activity: The Normal density curve applet 	33, 35, 39, 41, 43, 45, 47, 49, 51
4	2.2 Normal Distribution Calculations	<ul style="list-style-type: none"> Use Table A or technology to find (i) the proportion of values in a specified interval, or (ii) the value that corresponds to a given percentile in any Normal distribution. 	53, 55, 57, 59
5	2.2 Assessing Normality	<ul style="list-style-type: none"> Determine if a distribution of data is approximately Normal from graphical and numerical evidence. 	54, 63, 65, 66, 67, 69–74
6	Chapter 2 Review/FRAPPY!		Chapter 2 Review Exercises
7	Chapter 2 Test		

Chapter 3

Day	Topics	Learning Objectives Students will be able to ...	Suggested assignment
1	Chapter 3 Introduction 3.1 Explanatory and response variables, displaying relationships: scatterplots, describing scatterplots	<ul style="list-style-type: none"> Identify explanatory and response variables in situations where one variable helps to explain or influences the other. Make a scatterplot to display the relationship between two quantitative variables. Describe the direction, form, and strength of a relationship displayed in a scatterplot and recognize outliers in a scatterplot. Activity: CSI Stats – Missing Cookies Modeling 	1, 5, 7, 11, 13
2	3.1 Measuring linear association: correlation, facts about correlation	<ul style="list-style-type: none"> Interpret the correlation. Understand the basic properties of correlation, including how the correlation is influenced by outliers. Use technology to calculate correlation. Explain why association does not imply causation. 	14–18, 21
3	3.2 Least-squares regression, interpreting a regression line, prediction, residuals	<ul style="list-style-type: none"> Interpret the slope and y intercept of a least-squares regression line. Use the least-squares regression line to predict y for a given x. Explain the dangers of extrapolation. Calculate and interpret residuals. 	27–32, 35, 37, 39, 41, 45
4	3.2 Calculating the equation of the least-squares regression line, determining whether a linear model is appropriate: residual plots	<ul style="list-style-type: none"> Explain the concept of least squares. Determine the equation of a least-squares regression line using technology. Construct and interpret residual plots to assess if a linear model is appropriate. 	43, 47, 49, 51
5	3.2 How well the line fits the data: the role of s and r^2 in regression	<ul style="list-style-type: none"> Interpret the standard deviation of the residuals and r^2 and use these values to assess how well the least-squares regression line models the relationship between two variables. 	48, 50, 55, 58
6	3.2 Interpreting computer regression output, regression to the mean, correlation and regression wisdom	<ul style="list-style-type: none"> Determine the equation of a least-squares regression line using computer output. Describe how the slope, y intercept, standard deviation of the residuals, and r^2 are influenced by outliers. Find the slope and y intercept of the least-squares regression line from the means and standard deviations of x and y and their correlation. 	59, 61, 63, 65, 69, 71–78
7	Chapter 3 Review/FRAPPY!		Chapter Review Exercises
8	Chapter 3 Test		

Chapter 5

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	5.1 The Idea of Probability, Myths about Randomness	<ul style="list-style-type: none"> • Interpret probability as a long-run relative frequency. • Activity: “1-in-6 wins” game • Introduction to significance testing 	1, 3, 7, 9, 11
2	5.1 Simulation	<ul style="list-style-type: none"> • Use simulation to model chance behavior. • Applet: Probability simulation applet 	15, 17, 19, 23, 25
3	5.2 Probability Models, Basic Rules of Probability	<ul style="list-style-type: none"> • Determine a probability model for a chance process. • Use basic probability rules, including the complement rule and the addition rule for mutually exclusive events. 	27, 31, 32, 39, 41, 43, 45, 47
4	5.2 Two-Way Tables, Probability, and the General Addition Rule, Venn Diagrams and Probability	<ul style="list-style-type: none"> • 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. 	29, 33–36, 49, 51, 53, 55
5	5.3 What Is Conditional Probability?, The General Multiplication Rule and Tree Diagrams,	<ul style="list-style-type: none"> • Calculate and interpret conditional probabilities. • Use the general multiplication rule to calculate probabilities. • Use tree diagrams to model a chance process and calculate probabilities involving two or more events. 	57–60, 63, 65, 67, 71, 73, 77, 79
6	5.3 Conditional Probability and Independence: A Special Multiplication Rule	<ul style="list-style-type: none"> • Determine whether two events are independent. • When appropriate, use the multiplication rule for independent events to compute probabilities. 	81, 83, 85, 89, 91, 93, 95, 97–99
7	Chapter 5 Review/FRAPPY!		Chapter 5 Review Exercises
8	Chapter 5 Test		

Chapter 6

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	Chapter 6 Introduction, 6.1 Discrete Random Variables, Mean (Expected Value) of a Discrete Random Variable	<ul style="list-style-type: none"> • Compute probabilities using the probability distribution of a discrete random variable. • Calculate and interpret the mean (expected value) of a discrete random variable. • Activity: Bottle vs Tap Water • Introduction of random variable 	1, 3, 5, 7, 9, 11, 13
2	6.1 Standard Deviation (and Variance) of a Discrete Random Variable, Continuous Random Variables	<ul style="list-style-type: none"> • Calculate and interpret the standard deviation of a discrete random variable. • Compute probabilities using the probability distribution of a continuous random variable. 	14, 15, 17, 18, 21, 23, 25
3	6.2 Linear Transformations	<ul style="list-style-type: none"> • Describe the effects of transforming a random variable by adding or subtracting a constant and multiplying or dividing by a constant. 	27–30, 35, 37, 39–41, 43, 45
4	6.2 Combining Random Variables, Combining Normal Random Variables	<ul style="list-style-type: none"> • Find the mean and standard deviation of the sum or difference of independent random variables. • Find probabilities involving the sum or difference of independent Normal random variables. 	47, 49, 51, 53, 55, 57–59, 61
5	6.3 Binomial Settings and Binomial Random Variables, Binomial Probabilities	<ul style="list-style-type: none"> • Determine whether the conditions for using a binomial random variable are met. • Compute and interpret probabilities involving binomial distributions. 	63, 65, 66, 69, 71, 73, 75, 77
6	6.3 Mean and Standard Deviation of a Binomial Distribution, Binomial Distributions in Statistical Sampling	<ul style="list-style-type: none"> • Calculate the mean and standard deviation of a binomial random variable. Interpret these values in context. 	79, 81, 83, 85, 87, 89
7	6.3 Geometric Random Variables	<ul style="list-style-type: none"> • Find probabilities involving geometric random variables. 	93, 95, 97, 99, 101–104
8	Chapter 6 Review/FRAPPY!		Chapter 6 Review Exercises
9	Chapter 6 Test		

EXAM REVIEW: 3 DAYS

SEMESTER 1 EXAM: Simulated AP format with Multiple Choice, Free Response

Chapter 7

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	Introduction: German Tank Problem, 7.1 Parameters and Statistics	<ul style="list-style-type: none"> Distinguish between a parameter and a statistic. Activity: German Tank Problem 	1, 3, 5
2	7.1 Sampling Variability, Describing Sampling Distributions	<ul style="list-style-type: none"> Distinguish among the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic. Use the sampling distribution of a statistic to evaluate a claim about a parameter. Determine whether or not a statistic is an unbiased estimator of a population parameter. Describe the relationship between sample size and the variability of a statistic. 	7, 9, 11, 13, 15, 17, 19
3	7.2 The Sampling Distribution of \hat{p} , Using the Normal Approximation for \hat{p} .	<ul style="list-style-type: none"> Find the mean and standard deviation of the sampling distribution of a sample proportion \hat{p}. Check the 10% condition before calculating $\sigma_{\hat{p}}$. Determine if the sampling distribution of \hat{p} is approximately Normal. If appropriate, use a Normal distribution to calculate probabilities involving \hat{p}. Applet: Rossman Change Applet for Reese's Pieces Activity: The Candy Machine Investigating p-hat sampling distributions 	21–24, 27, 29, 33, 35, 37, 39
4	7.3 The Sampling Distribution of \bar{x} : Mean and Standard Deviation, Sampling from a Normal Population	<ul style="list-style-type: none"> Find the mean and standard deviation of the sampling distribution of a sample mean \bar{x}. Check the 10% condition before calculating $\sigma_{\bar{x}}$. If appropriate, use a Normal distribution to calculate probabilities involving \bar{x}. 	43–46, 49, 51, 53, 55
5	7.3 The Central Limit Theorem	<ul style="list-style-type: none"> Explain how the shape of the sampling distribution of \bar{x} is affected by the shape of the population distribution and the sample size. If appropriate, use a Normal distribution to calculate probabilities involving \bar{x}. 	57, 59, 61, 63, 65–68
6	Chapter 7 Review/FRAPPY!		Chapter 7 Review Exercises
7	Chapter 7 Test		Cumulative AP [®] Practice Exam 2

Chapter 8

Day	Topics	Learning objectives Students will be able to...	Suggested assignment
1	Chapter 8 Introduction; 8.1 The Idea of a Confidence Interval, Interpreting Confidence Intervals and Confidence Levels	<ul style="list-style-type: none"> Interpret a confidence interval in context. Interpret a confidence level in context. Applet: Confidence Intervals www.whfreeman.com/tps5e 	1, 3, 5, 7, 9
2	8.1 Constructing a Confidence Interval; Using Confidence Intervals Wisely	<ul style="list-style-type: none"> Determine the point estimate and margin of error from a confidence interval. Describe how the sample size and confidence level affect the length of a confidence interval. Explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval. 	10, 11, 13, 15, 17, 19
3	8.2 Conditions for Estimating p , Constructing a Confidence Interval for p , Putting It All Together: The Four-Step Process	<ul style="list-style-type: none"> State and check the Random, 10%, and Large Counts conditions for constructing a confidence interval for a population proportion. Determine critical values for calculating a $C\%$ confidence interval for a population proportion using a table or technology. Construct and interpret a confidence interval for a population proportion. 	20–24, 31, 33, 35, 37
4	8.2 Choosing the Sample Size	<ul style="list-style-type: none"> Determine the sample size required to obtain a $C\%$ confidence interval for a population proportion with a specified margin of error. 	39, 41, 43, 45, 47
5	8.3 The Problem of unknown σ , When σ Is Unknown: The t Distributions, Conditions for Estimating μ	<ul style="list-style-type: none"> Explain how the t distributions are different from the standard Normal distribution and why it is necessary to use a t distribution when calculating a confidence interval for a population mean. Determine critical values for calculating a $C\%$ confidence interval for a population mean using a table or technology. State and check the Random, 10%, and Normal/Large Sample conditions for constructing a confidence interval for a population mean. 	49–52, 55, 57, 59
6	8.3 Constructing a Confidence Interval for μ , Choosing a Sample Size	<ul style="list-style-type: none"> Construct and interpret a confidence interval for a population mean. Determine the sample size required to obtain a $C\%$ confidence interval for a population mean with a specified margin of error. 	61, 65, 69, 71, 73, 75–78
7	Chapter 8 Review/FRAPPY!		Chapter 8 Review Exercises
8	Chapter 8 Test		

Chapter 9

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	9.1 Stating Hypotheses, The Reasoning of Significance Tests, Interpreting P -values, Statistical Significance	<ul style="list-style-type: none"> State the null and alternative hypotheses for a significance test about a population parameter. Interpret a P-value in context. Determine if the results of a study are statistically significant and draw an appropriate conclusion using a significance level. Activity: I'm a great free-throw shooter! Significance Testing 	1, 3, 5, 7, 9, 11, 15
2	9.1 Type I and Type II Errors	<ul style="list-style-type: none"> Interpret a Type I and a Type II error in context, and give a consequence of each. 	13, 17, 19, 21, 23
3	9.2 Carrying Out a Significance Test, The One-Sample z Test for a Proportion	<ul style="list-style-type: none"> State and check the Random, 10%, and Large Counts conditions for performing a significance test about a population proportion. Perform a significance test about a population proportion. 	25–28, 31, 35, 39, 41
4	9.2 Two-Sided Tests, Why Confidence Intervals Give More Information, Type II Error and the Power of a Test	<ul style="list-style-type: none"> Use a confidence interval to draw a conclusion for a two-sided test about a population parameter. Interpret the power of a test and describe what factors affect the power of a test. Describe the relationship among the probability of a Type I error (significance level), the probability of a Type II error, and the power of a test. 	43, 45, 47, 51, 53, 55, 57
5	9.3 Carrying Out a Significance Test for μ , The One Sample t Test, Two-Sided Tests and Confidence Intervals	<ul style="list-style-type: none"> State and check the Random, 10%, and Normal/Large Sample conditions for performing a significance test about a population mean. Perform a significance test about a population mean. Use a confidence interval to draw a conclusion for a two-sided test about a population parameter. 	59–62, 65, 69, 73, 77, 79
6	9.3 Inference for Means: Paired Data, Using Tests Wisely	<ul style="list-style-type: none"> Perform a significance test about a mean difference using paired data. 	83, 85, 87, 89–91, 93, 95–102
7	Chapter 9 Review/FRAPPY!		Chapter 9 Review Exercises
8	Chapter 9 Test		

Chapter 10

Day	Topics	Learning Objectives Students will be able to...	Suggested assignment
1	“Is Yawning Contagious?” Activity, 10.1 The Sampling Distribution of a Difference between Two Proportions	<ul style="list-style-type: none"> Describe the shape, center, and spread of the sampling distribution of $\hat{p}_1 - \hat{p}_2$. 	1, 3
2	10.1 Confidence Intervals for $p_1 - p_2$	<ul style="list-style-type: none"> Determine whether the conditions are met for doing inference about $p_1 - p_2$. Construct and interpret a confidence interval to compare two proportions. 	5, 7, 9, 11
3	10.1 Significance Tests for $p_1 - p_2$, Inference for Experiments	<ul style="list-style-type: none"> Perform a significance test to compare two proportions. 	13, 15, 17, 21, 23
4	10.2 “Does Polyester Decay?” Activity, The Sampling Distribution of a Difference between Two Means	<ul style="list-style-type: none"> Describe the shape, center, and spread of the sampling distribution of $\bar{x}_1 - \bar{x}_2$. Determine whether the conditions are met for doing inference about $\mu_1 - \mu_2$. 	31, 33, 35, 51
5	10.2 The Two-Sample t Statistic, Confidence Intervals for $\mu_1 - \mu_2$	<ul style="list-style-type: none"> Construct and interpret a confidence interval to compare two means. 	25–28, 37, 39
6	10.2 Significance Tests for $\mu_1 - \mu_2$, Using Two-Sample t Procedures Wisely	<ul style="list-style-type: none"> Perform a significance test to compare two means. Determine when it is appropriate to use two-sample t procedures versus paired t procedures. 	41, 43, 45, 47, 53, 57–60
7	Chapter 10 Review/ FRAPPY!		Chapter 10 Review Exercises
8	Chapter 10 Test		Cumulative AP [®] Practice Exam 3

Chapter 11

Day	Topics	Learning objectives Students will be able to...	Suggested assignment
1	Activity: The Candy Man Can; 11.1 Comparing Observed and Expected Counts: The Chi-Square Statistic; The Chi-Square Distributions and <i>P</i> -values	<ul style="list-style-type: none"> • State appropriate hypotheses and compute expected counts for a chi-square test for goodness of fit. • Calculate the chi-square statistic, degrees of freedom, and <i>P</i>-value for a chi-square test for goodness of fit. 	1, 3, 5
2	11.1 Carrying Out a Test; Follow-Up Analysis	<ul style="list-style-type: none"> • Perform a chi-square test for goodness of fit. • Conduct a follow-up analysis when the results of a chi-square test are statistically significant. 	7, 9, 11, 15, 17
3	11.2 Comparing Distributions of a Categorical Variable; Expected Counts and the Chi-Square Statistic; The Chi-Square Test for Homogeneity	<ul style="list-style-type: none"> • Compare conditional distributions for data in a two-way table. • State appropriate hypotheses and compute expected counts for a chi-square test based on data in a two-way table. • Calculate the chi-square statistic, degrees of freedom, and <i>P</i>-value for a chi-square test based on data in a two-way table. • Perform a chi-square test for homogeneity. 	19–22, 27, 29, 31, 33, 35, 37, 39
4	11.2 Relationships between Two Categorical Variables; the Chi-Square Test for Independence; Using Chi-Square Tests Wisely	<ul style="list-style-type: none"> • Perform a chi-square test for independence. • Choose the appropriate chi-square test. 	41, 43, 45, 47, 49, 51–55
5	Chapter 11 Review/ FRAPPY!		Chapter 11 Review Exercises
6	Chapter 11 Test		

Chapter 12

Day	Topics	Learning Objectives Students will be able to ...	Suggested assignment
1	Activity: The Helicopter Experiment; 12.1 Sampling Distribution of b ; Conditions for Regression Inference	<ul style="list-style-type: none"> Check the conditions for performing inference about the slope β of the population (true) regression line. 	1, 3
2	12.1 Estimating the Parameters; Constructing a Confidence Interval for the Slope	<ul style="list-style-type: none"> Interpret the values of a, b, s, SE_b, and r^2 in context, and determine these values from computer output. Construct and interpret a confidence interval for the slope β of the population (true) regression line. 	5, 7, 9, 11
3	12.1 Performing a Significance Test for the Slope	<ul style="list-style-type: none"> Perform a significance test about the slope β of the population (true) regression line. 	13, 15, 17
4	12.2 Transforming with Powers and Roots	<ul style="list-style-type: none"> Use transformations involving powers and roots to find a power model that describes the relationship between two variables, and use the model to make predictions. 	19–24, 31, 33
5	12.2 Transforming with Logarithms; Putting it all Together: Which Transformation Should We Choose?	<ul style="list-style-type: none"> Use transformations involving logarithms to find a power model or an exponential model that describes the relationship between two variables, and use the model to make predictions. Determine which of several transformations does a better job of producing a linear relationship. 	35, 37, 39, 41, 43, 45, 47–50
6	Chapter 12 Review/ FRAPPY!		Chapter 12 Review Exercises
7	Chapter 12 Test		Cumulative AP [®] Practice Test 4

AP EXAM REVIEW (10 days)

- Practice AP Free Response Questions
- Choosing the Correct Inference Procedure
- Flash cards
- Mock Grading Sessions
- Rubric development by student teams
- Practice Multiple Choice Questions

Rubric for Chapter 1/4 Project

Response Bias Project	4 = Complete	3 = Substantial	2 = Developing	1 = Minimal
Introduction	<ul style="list-style-type: none"> • Describes the context of the research • Has a clearly stated question of interest • Provides a hypothesis about the question of interest • Question of interest is of appropriate difficulty 	<ul style="list-style-type: none"> • Introduces the context of the research and has a specific question of interest • Suggests hypothesis OR has appropriate difficulty 	<ul style="list-style-type: none"> • Introduces the context of the research and question of interest OR has question of interest and a hypothesis 	<ul style="list-style-type: none"> • Briefly describes the context of the research
Data Collection	<ul style="list-style-type: none"> • Method of data collection is clearly described • Includes appropriate randomization • Describes efforts to reduce bias, variability, confounding • Quantity of data collected is appropriate 	<ul style="list-style-type: none"> • Method of data collection is clearly described • Some effort is made to incorporate principles of good data collection • Quantity of data collected is appropriate 	<ul style="list-style-type: none"> • Method of data collection is described • Some effort is made to incorporate principles of good data collection 	<ul style="list-style-type: none"> • Some evidence of data collection
Graphs and Summary Statistics	<ul style="list-style-type: none"> • Raw data is included in a two-way table (categorical) or in lists (quantitative) • Appropriate graphs are included • Graphs are neat, easy to compare, and clearly labeled, including clear identification of treatments • Appropriate summary statistics are included in discussion (e.g., percentages for categorical data, means for quantitative data) 	<ul style="list-style-type: none"> • Appropriate graphs are included • Graphs are neat, clearly labeled, and easy to compare • Appropriate summary statistics or raw data are included 	<ul style="list-style-type: none"> • Graphs and summary statistics are included 	<ul style="list-style-type: none"> • Graphs or summary statistics are included
Conclusions	<ul style="list-style-type: none"> • Uses the results of the study to correctly answer question of interest • Discusses what inferences are appropriate based on study design • Shows good evidence of critical reflection (discusses possible errors, limitations.) 	<ul style="list-style-type: none"> • Makes a correct conclusion • Discusses what inferences are appropriate or shows good evidence of critical reflection 	<ul style="list-style-type: none"> • Makes a partially correct conclusion • Shows some evidence of critical reflection 	<ul style="list-style-type: none"> • Makes a conclusion
Poster, Presentation, & Communication	<ul style="list-style-type: none"> • Has a clear, holistic understanding of the project • Poster is well organized, neat, and easy to read • Poster included pictures of data collection in progress and is visually appealing • Oral is well organized 	<ul style="list-style-type: none"> • Has a clear, holistic understanding of the project, but poster is unorganized, lacks visual appeal, or oral presentation is not organized 	<ul style="list-style-type: none"> • The poster and oral presentation have several problems 	<ul style="list-style-type: none"> • Communication and organization are poor