



Stats 2: Beyond AP Statistics Scope & Sequence

Grading Period	Unit Title	Learning Targets
Throughout the School Year		*Apply mathematics to problems in everyday life *Use a problem-solving model that incorporates analyzing information, formulating a plan, determining a solution, justifying the solution and evaluating the reasonableness of the solution *Select tools to solve problems *Communicate mathematical ideas, reasoning and their implications using multiple representations *Create and use representations to organize, record and communicate mathematical ideas *Analyze mathematical relationships to connect and communicate mathematical ideas *Display, explain and justify mathematical ideas and arguments
Year-long Units of Study	Featherduster Surveys	-- Edit Featherduster survey questions according to polling industry best practices -- Conduct random sampling of the student body -- Conduct laptop-based polling with student participants -- Data wrangling of the responses spreadsheet -- Create graphs to be published in the Featherduster
	AP Research Collaboration	-- Provide statistical advice to student “clients” on the best study design to answer their research question -- Provide statistical advice to student “clients” on the proper analysis and display of their results
First Grading Period	Unit 1: Data Collection	Target 1.1: Planning & Executing Surveys -- Understand the characteristics and benefits of sampling techniques (AP) -- Understand and implement characteristics of good survey implementation -- Understand and implement characteristics of good survey questions -- Use correct interview etiquette

	Unit 1: Data Collection	Target 1.2: Statistical Reporting in the Media -- Correctly identify the nature and scope of studies as reported in the media(AP) -- Understand the information presented in polling reports -- Identify methods for coping with low response rates -- Understand the electoral college and 2016 election
	Unit 1: Data Collection	Target 1.3: Experiments -- Recognize experiment pioneers (Frances Oldham Kelsey) -- Explain how to establish causation when experiments aren't possible (Zika, smoking and cancer) -- Understand why blocking is effective -- Use correct notation for modeling response variables in experiments -- Use advanced techniques to design a study
Second Grading Period	Unit 2: Statistical Analysis using R and RStudio	Target 2.1: RStudio Basics - Correctly use the following commands in R: -- vectors: numeric, character, logical, names, indexing -- matrices: names, indexing -- factors: -- data frames -- exploratory plot vs. explanatory plot -- install.packages(), library(), attach() -- naming conventions in R
	Unit 2: Statistical Analysis using R and RStudio	Target 2.2: Data Wrangling - Correctly use the following commands in R: -- order(), str(), length() -- NA: is.na(vector) -- droplevels(), which(), subset() -- convert a quantitative variable to a categorical variable -- mutate from dplyr OR ifelse() -- counting elements -- sum(), length(), length(which())
	Unit 2: Statistical Analysis using R and RStudio	Target 2.3: Graphs - Use R to make the following: -- bar graphs (frequency and relative) -- segmented bar graphs (relative) -- pie graphs -- graphing parameters: par(), axis labels (with rotation), las, colors, margins,

		cex, family, title, mfrow -- histograms (hist and truehist), boxplots -- graphing parameters: breaks, lty, abline(v = mean), pch, xlim, ylim, legend
	Unit 2: Statistical Analysis using R and RStudio	Target 2.4: Basic Inference - Use R to compute the following: -- one proportion z-test/interval -- two proportion z-test/interval -- matched pair for proportions? (McNemar's Test) -- finite population correction factor?, +4? -- chi-squared tests -- one sample t-test/interval -- two sample t-test/interval -- by(quant, categ, mean) or tapply()? -- matched pair t-interval
	Unit 2: Statistical Analysis using R and RStudio	Target 2.5: Graphs and Inference for Linear Regression - Use R to: -- scatterplots -- graphing parameters: abline, points in different colors, labels, adj -- residuals plot -- generate computer output for linear regression
Third Grading Period	Unit 3: Nonparametric Analyses	Target 3.1: Conduct nonparametric Tests for Two Proportions: -- Simulation tests -- for() loops in R -- Binomial probability in R -- Fisher's Exact Test -- hypergeometric distribution in R
	Unit 3: Nonparametric Analyses	Target 3.2: Conduct nonparametric Tests for Means: -- Bootstrap Distribution for one mean -- Simulation tests for two means -- Simulation tests for matched pairs -- Rank Sum Test (Wilcoxon Test/Mann-Whitney U Test) -- Wilcoxon Signed-Rank Test

	Unit 4: ANOVA	Target 4.1: ANOVA -- Understand the dangers of inflated Type I error with multiple comparisons -- Use the F-distribution and the formula for the F-statistic to conduct an ANOVA test -- Understand and check the conditions for ANOVA -- Conduct ANOVA(including graphs) in R
	Unit 4: ANOVA	Target 4.2: ANOVA and multiple comparisons -- Distinguish between planned and unplanned comparisons -- Conduct Fisher's LSD -- Conduct Bonferroni's Adjustment -- Generate multiple comparisons output in R
Fourth Grading Period	Unit 5: Multiple Regression Analysis	Target 5.1: Inference for Bivariate Regression -- Construct confidence intervals for the mean response at a given x-value -- Construct prediction intervals for a response value at a given x-value -- Graph confidence intervals and prediction intervals in R
	Unit 5: Multiple Regression Analysis	Target 5.2: Multiple Regression Analysis -- Construct a model with multiple explanatory variables in R -- Use best subset methods (R^2 -adj and Mallows's C_p) to select a set of predictors -- Interpret coefficients and R^2 -adj
	Unit 5: Multiple Regression Analysis	Target 5.3: Additional Topics in Multiple Regression -- Use Forward Selection to select a set of predictors -- Use Backward Elimination to select a set of predictors -- Understand and use indicator variables -- Understand and use interaction terms
	Unit 6: Bayesian Statistics	Target 6.1: Bayesian Statistics for Discrete Variables -- Understand the shift in thinking away from frequentist ($P(\text{data} \text{model})$) and towards Bayesian ($P(\text{model} \text{data})$) -- Begin with a prior distribution, and incorporate sample data to create a posterior distribution -- Compute posterior distributions in R

	Unit 6: Bayesian Statistics	Target 6.2: Bayesian Statistics for Continuous Variables -- Use the beta distribution to generate posterior distributions for continuous variables -- Graph the prior and posterior distributions in R
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