

ADVANCED PLACEMENT STATISTICS-AP LEVEL

Code: M655 Full Year (11-12)(1 credit)

Prerequisite: Algebra 2 & Trigonometry
(rank weight 1.1)

Note: Each student is expected to take the Advanced Placement Statistics Examination in May. The fee is determined by the College Board and is the responsibility of the student. In the event that a student does not take the AP Exam, the student's report card and transcript will reflect only a course in high school Honors Statistics at a rank weight of 1.04.

Areas of Study Include:

- Data Displays
 - Displaying Distributions with Graphs: stem plots, histograms, ogives, percentiles, skewness, and outliers
 - Describing Distributions with Numbers: box plots, IQR criteria for outliers, mean, and standard deviation, transforming the mean and standard deviation.
 - Density Curves and Normal Distributions: probabilities, percentiles
 - Normal Calculations: z-scores, standard normal distribution, empirical formula, normal probability plots
- Data Relationships
 - Scatter plots: response and explanatory variables, overall pattern, linear and curved relationships, clusters, direction, strength, association, categorical variables
 - Correlation: meaning
 - Least Squares Regression: line of best fit, calculation of slope and intercept, predicting values, understanding r-squared using residual plots, outliers, and influential observations
 - Cautions using regression: extrapolation, causation, common response, lurking variables, confounded variables
 - Transforming Relationships: power, exponential, and logarithmic models
- Producing Data
 - Designing Samples: population and sample, sampling and census, voluntary response, convenience, bias, undercoverage, nonresponse, simple random samples, stratified random samples, multistage samples
 - Designing Experiments: subjects, treatments, factors, randomization, treatment diagrams, controls, double blind, block designs, matched pairs
 - Simulating Experiments: probability model, random numbers by table and by calculator
- Probability
 - Randomness: simulations
 - Probability Models: sample spaces, probability rules, disjoint events, independent events, conditional probability, and tree diagrams
 - Random Variables: discrete and continuous, normal distributions, expected value, rules for means, variance, rules for variances, law of large numbers
- Sampling Distributions
 - Binomial Distributions: binomial setting conditions, binomial probability, cumulative distributions, binomial mean and standard deviation, normal approximation, continuity correction, simulations
 - Geometric Distributions: geometric setting conditions, geometric probabilities, cumulative distributions, geometric mean standard deviation, simulations.
 - Sampling Distributions: parameter and statistics, simulations, bias and variability of a statistic
 - Sample Proportions: mean and standard deviation of a sample proportion, normal approximation, simulations
 - Sample Means: mean and standard deviation of a sample mean, sampling distribution of a sample mean from a normal population, The Central Limit Theorem., simulations

- Inference
 - Estimating with Confidence: statistical confidence, confidence interval for population means, critical values, effect of confidence level and sample size on margin of error
 - Tests of Significance: Null and alternative hypotheses, one and two sided alternatives, test statistics, p-values, statistical significance, versus practical significance, one-sample z statistic, four step inference procedure
 - Inference as Decision: type I and type II errors, Power of a test, increasing the power of a test
- Inference for Distributions
 - Inference for the Population Mean: standard error, t-statistic, t-distributions, t-tables, one-sample t-test, t-confidence interval, matched pairs t-procedures, four step inference procedure
 - Comparing Two Means: standard error, two sample t-statistic, two-sample t-test, two sample t-confidence interval, degree of freedom approximations, and pooled two-sample t-procedures
- Inference for Proportions
 - Inference for a Population Proportion: standard error of \hat{p} , confidence intervals, requirements, z-procedures, sample size and margin of error, four step procedure
 - Comparing Two Proportions: standard error, pooled sample proportion, confidence intervals for comparing two proportions, z-test for two proportions
- Inference for Tables
 - Relations in Categorical Data: marginal distributions, describing relations in two way tables, conditional distributions, Simpson's paradox
 - Test for Goodness of Fit: chi-square distributions, degrees of freedom, p-values
 - Inference for Two Way Tables: observed and expected counts, degrees of freedom, chi-square statistic, chi-square tests of homogeneity, chi-square tests of association and independence, four step procedure
- Inference for Regression
 - Inference about the Model: the regression model requirements, the true regression line, residuals, standard error about the line, degrees of freedom, confidence intervals for the regression slope, significance test for regression slope, t-statistic
 - Predictions and Conditions: confidence interval for mean response, prediction interval for a single observation, regression conditions, using residual plots
- Analysis of Variance (Post AP Exam Topic)
 - Inference for a Population Spread: cautions, F-Test for comparing two standard deviations, degrees of freedom, F statistic, F distributions
 - One-Way Analysis of Variance: multiple comparisons, analysis of variance F-test, ANOVA F statistic, degrees of freedom, ANOVA conditions, mean squares, mean square for groups, mean square for error, ANOVA tables

Assessment: Final project or final exam

For the complete AP Curriculum see <http://apcentral.collegeboard.com/apc/Controller.jspf>

Textbook: *The Practice of Statistics, 3rd Edition*, published by W. H. Freeman, © 2008