

Colton Joint Unified School District Course of Study
Course Description for **Advanced Placement Statistics (41811/2)**

DEPARTMENT:	Mathematics
GRADE:	11-12
LENGTH:	One year
PREREQUISITE:	Successful completion of Algebra II or IMP III with a grade of “C” or better.
CREDITS EARNED:	10 (Ten)

COURSE DESCRIPTION: This subject introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will be exposed to the conceptual themes of exploring data, planning a study, anticipating patterns, and statistical inference.

EXIT CRITERIA: By the end of the school year, students are expected to be able to:

Explore Data: Observe Patterns and Departures from Patterns

1. Interpret graphical displays of distributions of univariate data (dot-Plot, stem-plot, and histogram).
 - Center and spread.
 - Clusters and gaps.
 - Outliners and other unusual features
 - Shapes.
2. Summarize distributions of univariate data.
 - Measuring center: median, mean.
 - Measuring spread: range, inter-quartile range, standard deviation
 - Measuring position: quartiles, percentiles, standardized scores (z-scores).
 - Using box-plots.
 - The effect of changing units on summary measures
3. Compare distributions of univariate data (dot-plots, back-to-back stem-plots, parallel box-plots).
 - Comparing center and spread: within group, between group variation.
 - Comparing clusters and gaps.
 - Comparing outliners and other unusual features.
 - Comparing shapes.
4. Exploring bivariate data.
 - Analyzing patterns in scatter-plots.

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- Correlation and linearity.
 - Least squares regression line.
 - Residual plots, outliers, and influential points.
 - Transformations to achieve linearity, logarithmic and power transformations.
5. Exploring categorical data: frequency tables.
- Marginal and joining frequencies for two-way tables.
 - Conditional relative frequencies and association.

Planning a Study: Deciding What and How to Measure

1. Overview of methods of data collection.
 - Census
 - Sample Survey
 - Experiment
 - Observational
2. Planning and conducting surveys.
 - Simple random sampling.
 - Characteristics of a well-designed and conducted survey.
 - Sampling error: the variation inherent in a survey.
 - Sources of bias in surveys.
 - Stratifying to reduce variation.
3. Planning and conducting experiments.
 - Experiments versus observational studies versus surveys.
 - Confounding, control groups, placebo effects, blinding.
 - Treatments, experimental units, and randomization.
 - Completely randomized design for two treatments.
 - Randomized paired comparison design.
 - Replication, blocking, and generalization of results.

Anticipation Patterns: Producing models using probability and simulation.

1. Probability as relative frequency.
 - “Law of Large Numbers” concept.
 - Addition rule, multiplication rule, conditional probabilities, and independence.
 - Discrete random variables and their probability distribution.
 - Simulation of probability distributions, including binomial and geometric.

- Mean (expected value) and standard deviation of a random variable, including binomial.
2. Combining independent random variable.
 - Notion of independence versus dependence.
 - Mean and standard deviation for sums and differences of independent random variable.
 3. The normal distribution.
 - Properties of normal distribution.
 - Using tables of the normal distribution.
 - The normal distribution as a model for measurements.
 4. Simulating sampling distribution.
 - Sampling distribution of a sample mean.
 - Sampling distribution of a sample proportion.
 - Central Limit Theory.
 - Sampling distribution of a difference between two independent sample proportions.
 - Sampling distribution of a difference between two independent sample means.

Statistical Inference: Confirming models

1. Confidence intervals.
 - The Meaning of a confidence interval.
 - Large sample confidence interval for a proportion.
 - Large sample confidence interval for a mean.
 - Large sample confidence interval for a difference between two proportions.
2. Tests of significance.
 - Logic of significance testing, null and alternative hypotheses; p-value; one and two-sided tests.
 - Large sample test for a proportion.
 - Large sample test for a mean.
 - Large sample test for a difference between two proportion.
 - Large sample confidence interval for a difference between two means (unpaired and paired).
 - Chi-square test for goodness of fit, homogeneity of proportions, and independence.
3. Special case of normally distributed data.

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- T-distribution.
- Single sample t procedures.
- Two sample (independent and matched pairs) t procedures.
- Inference for slope of least square lines.

GRADING CRITERIA:	Required Activities	Percentages
	Homework and Class Participation (including after-school or Saturday sessions to practice and study for the AP exam)	25%
	Tests and Quizzes	50%
	<u>Final Exam</u>	<u>25%</u>

TEXTBOOK: **Introduction to the Practice of Statistics, 2nd ed.**
Author: David S. Moore and George McCabe
Publisher: W.H. Freeman
Copyright 1993

SUPPLEMENTARY: **Statistics: The Exploration and Analysis of Data**
Author: Jay Debores and Roxy Peck
Publisher: Duxbury Press
Copyright: 1993

A Data-Based Approach to Statistics
Author: Ronald L. Iman
Publisher: Duxbury Press
Copyright 1994

Statistics and Data Analysis, 2nd ed.
Author: Andrew F. Siegel and Charles J. Morgan
Publisher: John Wiley & Sons
Copyright: 1996

The Basic Practice of Statistics
Author: David S. Moore
Publisher: W.H. Freeman
Copyright: 1996

Statistics: Learning in the Presence of Variation
Author: Robert L. Wardrop
Publisher: William C. Brown
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