

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

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<b>DEPARTMENT:</b>	Mathematics
<b>GRADE:</b>	11-12
<b>LENGTH:</b>	One year
<b>PREREQUISITE:</b>	Successful completion of Algebra II or IMP III with a grade of “C” or better.
<b>CREDITS EARNED:</b>	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.

<b>GRADING CRITERIA:</b>	<b>Required Activities</b>	<b>Percentages</b>
	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, 2<sup>nd</sup> 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, 2<sup>nd</sup> 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  
Copyright        1995