

Advanced Placement Statistics (9520)

Description This course is an introductory college-level course in statistics. Students study the major statistical concepts and tools for collecting, analyzing and drawing conclusions from data. The course topics are divided into the four major themes of exploratory analysis, planning a study, probability, and statistical inference. Students may elect to take the Advanced Placement Statistics Examination in May for possible college credit.

Credits 1

Prerequisites Advanced Algebra

Textbooks/Resources Daren S. Starnes, Josh Tabor, Daniel S. Yates, and David S. Moore, *The Practice of Statistics for Advanced Placement (AP®) Statistics, 5/E, High School Edition*, W.H. Freeman and Company/BFW New York 2015 (ISBN 9781464108730)

Required Assessments

Board Approved May 1997

Revised April 1998

AASD Mathematics Goals for K-12 Students

- *Become mathematical problem solvers.*
- *Learn to reason mathematically.*
- *Learn to communicate mathematically.*
- *Make mathematical connections.*
- *Develop conceptual understanding of mathematics.*
- *Develop procedural fluency.*
- *Learn to use technology appropriately.*

AASD Mathematics Standards for Grades 9-12 Students

| <u>Content Strand</u> | <u>Content Standard</u> |
|---------------------------------------|--|
| I. Mathematical Processes | <ul style="list-style-type: none"> A. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: reasoning B. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: oral and written communication C. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: use of appropriate technology |
| II. Number Operations & Relationships | <ul style="list-style-type: none"> A. Use numbers effectively for counting B. Use numbers effectively for measuring C. Use numbers effectively for estimating D. Use numbers effectively for problem solving |
| III. Geometry | <ul style="list-style-type: none"> A. Use geometric concepts to interpret, represent and solve problems B. Use geometric relationships to interpret, represent and solve problems C. Use geometric procedures to interpret, represent and solve problems |
| IV. Measurement | <ul style="list-style-type: none"> A. Select and use appropriate tools and techniques to measure to a specified degree of accuracy B. Use measurements in problem-solving situations |
| V. Statistics & Probability | <ul style="list-style-type: none"> A. Use data collection and analysis B. Use statistics in problem-solving situations C. Use probability in problem-solving situations |
| VI Algebraic Relationships | <ul style="list-style-type: none"> A. Discover, describe and generalize simple and complex patterns and relationships B. Use algebraic techniques to define and describe real-world problems to determine and justify appropriate solutions |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| <p>1. Compare graphical displays of distributions of univariate data (dotplot, stemplot, histogram).</p> | <p>Performance will be satisfactory when the student:</p> <ol style="list-style-type: none"> constructs a stemplot with consideration to center and spread; clusters and gaps; outliers and other unusual features; and shape. constructs a dotplot with consideration to center and spread; clusters and gaps; outliers and other unusual features; and shape. constructs a histogram with consideration to center and spread; clusters and gaps; outliers and other unusual features; and shape. compares distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots) with consideration to center and spread; clusters and gaps; outliers and other unusual features; and shape. | <ul style="list-style-type: none"> Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |
| <p>2. Summarize distributions of univariate data.</p> | <p>Performance will be satisfactory when the student:</p> <ol style="list-style-type: none"> measures the center (median, mean) of distributions. measures the spread (range, interquartile range, standard deviation) of distributions. measures the position (quartiles, percentiles, standardized scores like z-scores) of distributions. constructs boxplots to summarize distributions. examines the effect of changing units on summary measures. | <ul style="list-style-type: none"> Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|--|---|---|
| <p>3. Explore bivariate and categorical data.</p> | <p>Performance will be satisfactory when the student:</p> <ol style="list-style-type: none"> analyzes patterns in scatterplots. determines correlation and linearity of a set of data. fits a least squares regression line to a set of data. creates a residual plot considering outliers and influential points of a set of data. makes transformations (logarithmic and power) to achieve linearity. determines marginal and joint frequencies for two-way tables. determines conditional relative frequencies and association using frequency tables. | <ul style="list-style-type: none"> Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|---|---|---|
| <p>4. Conduct surveys and experiments.</p> | <p>Performance will be satisfactory when the student:</p> <ul style="list-style-type: none"> a. identifies the methods of data collection: census, sample survey, experiment and observational study. b. explains simple random sampling. c. identifies characteristics of a well-designed and conducted survey. d. determines sampling error (the variation inherent in a survey). e. finds sources of bias in surveys. f. uses stratifying to reduce variation. g. differentiates among experiments, observational studies, and surveys. h. identifies confounding, control groups, placebo effects and blinding. i. identifies treatments, experimental units and randomization. j. complete randomized design for two treatments. k. makes randomized paired comparison design. l. utilizes replication, blocking and generalizability of results. | <ul style="list-style-type: none"> • Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|--|--|---|
| <p>5. Use probability to study data.</p> | <p>Performance will be satisfactory when the student:</p> <ul style="list-style-type: none"> a. identifies probability as relative frequency. b. applies the “Law of large numbers” concept; addition and multiplication rules; conditional probabilities; and independence. c. identifies discrete random variables and their probability distributions. d. simulates probability distribution (including binomial and geometric). e. finds the mean (expected value) and standard deviation of a random variable, including binomial. f. combines independent random variables by considering the notion of independence versus dependence; and by considering mean and standard deviation for sums and differences of independent random variables. g. identifies the properties of the normal distribution and the normal distribution as a model for measurements. h. uses the tables of the normal distribution. i. simulates sampling distribution of a sample proportion and sample mean. j. applies the Central Limit Theorem. k. analyzes the sampling distribution of a difference between two independent sample proportions and between two independent sample means. | <ul style="list-style-type: none"> • Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |

| Essential Learning Objectives | Performance Indicators | Classroom Assessments |
|--|---|---|
| <p>6. Use statistical inference in selecting appropriate models.</p> | <p>Performance will be satisfactory when the student:</p> <ol style="list-style-type: none"> identifies the meaning of a confidence interval. determines the large sample confidence interval for a proportion; mean; difference between 2 proportions; and difference between 2 means (unpaired and paired). identifies the logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests. uses the tests of significance: large sample test for a proportion; mean; difference between 2 proportions; and difference between 2 means (unpaired and paired). uses Chi-square test for goodness of fit, homogeneity of proportions, and independence. applies the special case of normally distributed data: t distribution, single sample t procedures, 2 sample (independent and matched pairs) t procedures; inference for slope of least squares lines. | <ul style="list-style-type: none"> Unit assessment |
| <p>Objectives are linked to these AASD standards: Mathematics: Statistics and Probability</p> | | |

Resources and learning activities that address course objectives: