

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



Statistics and Probability

| | |
|---|--|
| Board Approval Date: May 20, 2021 | Course Length: 2 Semesters |
| Grading: A-F | Credits: 5 Credits per Semester |
| Proposed Grade Level(s): 11, 12 | Subject Area: Mathematics Elective Area (if applicable): N/A |
| Prerequisite(s): “C” or better in Mathematics II | Corequisite(s): N/A |
| CTE Sector/Pathway: N/A | |
| Intent to Pursue ‘A-G’ College Prep Status: Yes | |
| A-G Course Identifier: (c) Mathematics | |
| Graduation Requirement: Yes | |
| Course Intent: District Course Program (if applicable): N/A | |
| <p>The Folsom Cordova Unified School District prohibits discrimination, intimidation, harassment (including sexual harassment) or bullying based on a person’s actual or perceived ancestry, color, disability, race or ethnicity, religion, gender, gender identity or gender expression, immigration status, national origin, sex, sexual orientation, or association with a person or group with one or more of these actual or perceived characteristics. For concerns/questions or complaints, contact the Title IX Coordinator(s) and Equity Compliance Officer(s): Curtis Wilson, cmwilson@fcusd.org (grades K-5) and Jim Huber, Ed. D., jhuber@fcusd.org (grades 6-12), 1965 Birkmont Drive, Rancho Cordova, CA 96742, 916-294-9000 ext.104625</p> | |

COURSE DESCRIPTION: (Online Course)

Probability and Statistics provides a curriculum focused on understanding key data analysis and probabilistic concepts, calculations, and relevance to real-world applications. Students are challenged to work toward mastery of computational skills, apply calculators and other technology in data analysis, deepen their understanding of key ideas and solution strategies, and extend their knowledge through a variety of problem-solving applications. Course topics include types of data, common methods used to collect data, and representations of data, including histograms, bar graphs, box plots, and scatterplots. Students learn to work with data by analyzing and employing methods of extending results, involving samples and populations, distributions, summary statistics, experimental design, regression analysis,

simulations, and confidence intervals. Ideas involving probability — including sample space, empirical and theoretical probability, expected value, and independent and compound events — are covered as students explore the relationship between probability and data analysis. Extended projects allow for more open-ended, extended applications of concepts and skills. Students collect and analyze statistical data about a topic that interests them, and they apply probability concepts in a real-world context.

DETAILED UNITS OF INSTRUCTION:

| Unit Number/Title | Unit Essential Questions | Examples of Formative Assessments | Examples of Summative Assessment |
|---|---|---|---|
| 1. Introduction to Statistics | What is statistics? What are the different sampling methods? What are some implications of the inappropriate use of data? What is experimental design? How are statistics used in the real-world? | *Practice problems on Intro to Statistics | *Discuss: Applying Experimental Design Concepts to Real-World Studies *Unit Test |
| 2. Describing Data Graphically | What are the different statistical graphs? How do graphs enhance the display of data? How does one know which graph is appropriate to use for a given set of data? | *Practice problems on Graphing Data | *Unit Test |
| 3. Measures of Center and Spread | Why does one need to analyze the center and spread of data? In what situations might it be useful to compare the spread of data? How do you calculate and interpret box plots, comparative box plots, and modified box plots? | *Practice problems on Measures of Center and Spread | *Project: Statistical Investigation *Unit Test |
| 4. Describing Data Sets | How do you describe distributions using measures of center, shape, and spread for single and comparative data sets? How do you calculate the | *Practice problems on Describing Data Sets | *Discuss: Displaying and Describing Real-World Data *Unit Test |

| | | | |
|---------------------------------------|--|---|--|
| | effects of transformations on the center, shape, and spread? | | |
| 5. Modeling Data | <p>How do you create scatter plots for bivariate data and recognize positive and negative correlations?</p> <p>How do you calculate and interpret Pearson's sample correlation coefficient?</p> <p>What is regression analysis?</p> <p>How do you interpret correlation coefficients (r-values), coefficients of determination (r^2- values), and residual plots?</p> <p>How do you apply nonlinear regression?</p> | *Practice problems on Modeling Data | <p>*Discuss: Nonlinear Models</p> <p>*Discuss: Transforming Real-World Bivariate Data</p> <p>*Unit Test</p> |
| 6. Introduction to Probability | <p>How do you create e sample spaces, events, and outcomes?</p> <p>What are permutations and combinations?</p> <p>How do you find probabilities using permutations and combinations?</p> <p>What are independent and dependent events, and how do you classify events as independent or dependent?</p> | *Practice problems on Intro to Probability | *Unit Test |
| 7. Applications of Probability | <p>What is the difference between joint and marginal frequencies?</p> <p>How can you use two-way frequency tables in probability?</p> <p>How can you simulate a random event using random number generators and rows of random digits and use results to estimate probabilities empirically?</p> | *Practice problems on Applications of Probability | <p>*Discuss: Using Simulations to Explore Real-World Concerns</p> <p>*Project: Board Game Design</p> <p>*Unit Test</p> |

| | | | |
|--|---|--|---|
| 8. Discrete Probability Distributions | How do you identify a discrete random variable and a binomial probability and calculate their probability distributions, means, and standard deviations? | *Practice problems on Discrete Probability Distributions | *Unit Test |
| 9. Continuous Probability Distributions | How do you identify a continuous random variable and calculate its probability distribution? What is a normal curve? Why is an understanding of the normal curve essential to statistics? In what situations can the normal curve be applied to data? | *Practice problems on Continuous Probability Distributions | *Discuss: Checking for Normal Probability Distributions *Unit Test |
| 10. Sample Distributions and Confidence Intervals | What is the difference between a parameter and a statistic? What is the Central Limit Theorem? How is the Central Limit Theorem applied to sampling distributions? What is a confidence interval? Why is it necessary to apply confidence intervals when attempting to generalize results of a sample to the population in the aggregate? How do you evaluate the design of a study, the appropriateness of its analysis, and the validity of its conclusions? | *Practice problems on Sampling and Confidence Intervals | *Discuss: Analyzing Real-World Reports *Unit Test |

Unit 6&12: Summative Assessments

ESSENTIAL STANDARDS:

Interpreting Categorical and Quantitative Data

Summarize, represent, and interpret data on a single count or measurement variable.

S-ID 3: Interpret differences in shape, center and spread in the context of the data, accounting for possible effects of outliers.

S-ID 4: Use the mean and standard deviation of a data set to fit it to a normal distribution and estimate percentages.

S-ID 5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of data. Recognize possible associations and trends in the data.

S-ID 8: Compute using technology and interpret a linear regression model and correlation.

S-ID 9: Distinguish between correlation and causation.

Making Inferences and Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments.

S-IC 1: Understand statistics is a process for making inferences about population parameters based on a random sample from that population.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

S-IC 3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC6: Evaluate reports based on data.

Conditional Probability and the Rules of Probability

Understand independence and conditional probability and use them to interpret data.

S-CP-5: Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

Use the Rules of probability to compute probabilities of compound events in a uniform probability model.

S-CP-7: Apply the addition rule and interpret the answer in the terms of the model.

S-CP-8: Apply the general multiplication rule and interpret the answer in the terms of the model.

S-CP-9: Use permutation and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions

Use probability to evaluate outcomes of decisions.

S-MD-7: Analyze decisions and strategies using probability concepts.

RELEVANT STANDARDS AND FRAMEWORKS, CONTENT/PROGRAM SPECIFIC STANDARDS:

Link to Common Core Standards (if applicable):

Educational standards describe what students should know and be able to do in each subject in each grade. In California, the State Board of Education decides on the standards for all students, from kindergarten through high school.

<https://www.cde.ca.gov/be/st/ss/documents/ccssmathstandardaug2013.pdf>

Link to Framework (if applicable):

Curriculum frameworks provide guidance for implementing the content standards adopted by the State Board of Education (SBE). Frameworks are developed by the Instructional Quality Commission, formerly known as the Curriculum Development and Supplemental Materials Commission, which also reviews and recommends textbooks and other instructional materials to be adopted by the SBE.

<https://www.cde.ca.gov/ci/ma/cf/documents/mathfwstatandprobability.pdf>

Link to Subject Area Content Standards (if applicable):

Content standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level.

Link to Program Content Area Standards (if applicable):

Program Content Area Standards applies to programs such as International Baccalaureate, Advanced Placement, Career and Technical Education, etc.

TEXTBOOKS AND RESOURCE MATERIALS:

Textbooks

| Board Approved | Pilot Completion Date (If applicable) | Textbook Title | Author(s) | Publisher | Edition | Date |
|-----------------------|--|---|------------------|---------------------|----------------|-------------|
| <i>Yes</i> | | <i>APEX: Probability and Statistics</i> | | APEX Online Courses | | <i>2019</i> |

Other Resource Materials

N/A

Supplemental Materials

Board approved supplemental materials (Including but not limited to: Film Clips, Digital Resources, Supplemental texts, DVDs, Programs (Pebble Creek, DBQ, etc.):

N/A