Glendale Unified School District

High School

June 21, 2022

Department:	Mathematics
Course Title:	Introduction to Statistics and Probability
Course Code:	3197D
Grade Level(s):	11-12
School(s) Course Offered:	Glendale High School, Crescenta Valley High School, Hoover High School, Daily High School
UC/CSU Approved (Y/N, Subject):	Y, (C) Mathematics
Recommended Prerequisite:	Integrated III or Integrated II for seniors
Recommended Textbook:	*Statistics and Probability with Applications (4th edition)*, by Daren Starnes, Josh Tabor and Luke Wilcox. BFW Publishers, 2021.
Course Overview:	Statistics is a one-semester introductory course to the basics and fundamentals of statistics and probability. It is designed to teach students the process of statistical analysis, from collecting data, to organizing data using graphs, analyzing data using statistical measures, the basics of probability, and an introduction to using probability toward an understanding of inference. By the end of the class, students will be able to look at real-world usages of statistics, from analyzing and critiquing a study to carrying out their own studies and will be prepared for college-level statistics. Technology will be utilized with the TI-84 graphing calculator and/or computer software (such as StatCrunch, Excel, SPSS) throughout this course, and all learning will be conducted through events and projects.

Analyzing univariate and bivariate datasets (Chapters 1, 2 & 3)

Learning Objectives: Students will be introduced to the types of data that can be collected (categorical and numerical). From there, students will move on to how to graphically display that data in manners such as dotplots, stemplots, histograms, boxplots, and scatterplots, in addition to evaluating the strengths and weaknesses of each type of display. Next, students will also look at methods of summarizing univariate data with measures of center, variability, and determining what constitutes an outlier. Lastly, students will learn how to assess bivariate numerical data using scatterplots by looking at concepts such as linear regression, correlation, and transforming curved data to a linear model.

Standards: CCSS.MATH.CONTENT.HSS.ID.A.1, ID.A.2, ID.A.3, ID.B.5, ID.B.6, ID.C.9

Assignments: Students will work on a group project to gather real-world data on an interesting question to be answered using bivariate numerical data. Students will propose a question/relationship they want to investigate that involves 2 numerical variables, go and collect the data, and then use methods of analysis to determine whether two variables are correlated, to what extent they are correlated, and what model would best describe the data they have. Students will produce a simple oral/powerpoint presentation and a 1-2 page report detailing their process of how they collected the data, appropriate diagrams to display their data, and their reasoning for choosing a model, if any. Students will learn how to collect data in an unbiased and reasonable manner and use that data to make a simple statistical conclusion to answer a question they proposed.

Methods of collecting data (Chapter 4)

Learning Objectives: Students will be introduced to the two primary types of studies that exist (observational and experimental). From there, students will learn what are the key aspects of a well-designed observational study, including types of sampling (such as simple random samples, stratified, and cluster) and types of biases that can exist (such as selection, non-response, and response biases). Next, students will be introduced to the principles of a well-designed experiment, with a focus on assignment (such as using random assignment or blocking), how confounding variables can affect results, and how to control for confounding variables.

Standards: CCSS.MATH.CONTENT.HSS.IC.A.1, IC.A.2, IC.B.3, IC.B.4, IC.B.5, IC.B.6

Assignments: Pairs or small groups of students will be given a detailed pre-determined scenario and be asked to design an experiment to answer a question that is presented about the scenario.

Students will use the principles of experimental design to determine what they believe is the best, and most feasible, method to get an answer to the question presented. After a few days of working on it during class, students will give an oral presentation to explain to the class what their scenario entails, what question they are trying to answer, and how they designed their experiment. At the end of each presentation, there will be a Q & A session where other students are able to critique what they heard and ask questions about the methods chosen by the presenters. Students will have learned how to design a good experiment, collaborated with others to develop an experiment, and been able to handle critique and answer questions from others about a product they produced.

Probability (Chapter 5)

Learning Objectives: Students will be introduced to the fundamentals of probability, both classical and empirical. Students will learn basic probability rules, and then extend them to independent and conditional situations. Students will also be exposed to calculate probabilities using 2-way tables and tree diagrams, which is often more intuitive and understandable for students. Next, students will use simulations to determine probabilities that cannot be done in a classical manner. Lastly, students extend this understanding into using normal distributions to determine the probability of an occurrence happening.

Standards: CCSS.MATH.CONTENT.HSS.CP.A.1, CP.A.2, CP.A.3, CP.A.4, CP.A5, CP.B.9, MD.A.4

Assignments: Students will be given a challenge problem to figure out what would make a marble game "fair." Students are given a situation where some black marbles are placed in a bag (various amounts for different problems) and a person will draw out two marbles. Students need to determine how many white marbles should be placed in the bag so that a student has a "fair"/"equal" chance of drawing two marbles of the same color or two marbles of different color. Students will be able to work with each other and have to apply the concepts of conditional probability to a reasonably complex situation.

Random variables and introduction to inference (Chapters 6, 7, 8)

Learning Objectives: Students will be introduced to the concept of random variables and how they are used to create probability distributions. Next, students will analyze binomial and geometric situations and use principles of probability to analyze them to determine things such as expected values and standard deviations. After this, students will be introduced to sampling distributions and how they are created. Lastly, students will be introduced to how sampling distributions can lead to the concept of confidence intervals to estimate an unknown value.

Standards: CCSS.MATH.CONTENT.HSS. MD.A.1, MD.A.2, MD.A.3, MD.A.4, MD.B.5

Assignments: Students will collect pennies from their life, either found on the ground, gotten as change, etc. Class data will be collected on the ages of the pennies, which will create a skewed distribution. Afterwards, students will take many random samples of the pennies, and then data will be collected for each sample in order to create a sampling distribution for the class. Students should see that a sampling distribution that they created from a skewed population will be normally distributed, illustrating the central limit theorem.

90-Day Pacing Guide:

Chapter	**Number of Lessons**	**Number of Days**
Chapter 1: Analyzing One-Variable Data	8	12
Chapter 2: Modeling One-Variable Quantitative Data	5	8
Chapter 3: Analyzing Two-Variable Data	7	10
Chapter 4: Collecting Data	8	12
Chapter 5: Probability	4	9
Chapter 6: Random Variables	5	14
Chapter 7: Sampling Distributions	5	10
Chapter 8: Estimating a Parameter	6	12
Chapter 9: Testing a Claim	Omit	Omit
Chapter 10: Comparing Two Populations or Treatments	Omit	Omit
Chapter 11: Inference for Distributions and Relationships	Omit	Omit
Review & Final		3
Total	**48**	**90**