WARREN COUNTY SCHOOL DISTRICT

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Statistics
Course Number: 00282
Course Prerequisites: Grade of 75% or higher in Algebra I College Preparatory, Algebra II College
　　　　　　　　　　　　Preparatory, and Geometry College Preparatory

Course Description: The Statistics is an academic course that covers methods of summarizing data, descriptive statistics, probability and probability distributions, sampling distributions, the central limit theorem, hypothesis testing, analysis of variance, and regression analysis. District marking period assessments are required.

Suggested Grade Level: Grades 11-12
Length of Course: Two Semesters
Units of Credit: 1
PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:
CSPG #50 Mathematics (7-12)
To find the CSPG information, go to CSPG
Certification verified by the WCSD Human Resources Department: ☒Yes   ☐No

WCSD STUDENT DATA SYSTEM INFORMATION

Course Level: Academic
Mark Types: Check all that apply.
　　　　　　　　☒F – Final Average   ☒MP – Marking Period   ☒EXM – Final Exam

GPA Type: ☐ GPAEL-GPA Elementary   ☐ GPAML-GPA for Middle Level   ☒ NHS-National Honor Society
　　　　　　　　☒ UGPA-Non-Weighted Grade Point Average   ☒ GPA-Weighted Grade Point Average

State Course Code: 02205
To find the State Course Code, go to State Course Code, download the Excel file for *SCED*, click on SCED 6.0 tab, and choose the correct code that corresponds with the course.

TEXTBOOKS AND SUPPLEMENTAL MATERIALS

Board Approved Textbooks, Software, and Materials:

Title:	*Elementary Statistics – Picturing the World, 7th edition*
Publisher:	Pearson Education, Inc.
ISBN #:	978-0-13-468341-6
Copyright Date:	2019
WCSD Board Approval Date:	6/29/2020

Supplemental Materials: Kuta Software, SAS pdesas.org, Khan Academy, IXL, Brainfuse, Online Calculator: Desmos, Graphing Calculator: TI-83 Plus

Curriculum Document

WCSD Board Approval:

Date Finalized:	5/23/2022
Date Approved:	6/13/2022
Date(s) Revised:	6/12/2023
Implementation Year:	2022-2023

SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

SCOPE AND SEQUENCE OF CONTENT, AND CONCEPTS

Marking Period 1: Introduction to Statistics and Descriptive Statistics

- Basics of Statistics
- Data Classification
- Data Collection and Experimental Design
- Frequency Distributions and Graphs
- Statistical Graphs and Displays
- Measures of Central Tendency
- Measures of Variation
- Measures of Position
- **Marking Period 1 Review and Assessment**

Marking Period 2: Probability and Discrete Probability Distributions

- Basic Concepts of Probability and Counting
- Conditional Probability and the Multiplication Rule
- The Addition Rule
- Permutations and Combinations
- Application of the Counting Principals
- Probability Distributions
- Binomial Distributions
- Discrete Probability Distributions
- **Marking Period 2 Review and Assessment**

Marking Period 3: Normal Probability Distributions and Confidence Intervals

- Normal Distributions and the Standard Normal Distribution
- Normal Distributions: Finding Probabilities
- Normal Distributions: Finding Values
- Sample Distributions and the Central Limit Theorem
- Normal Approximations to Binomial Distributions
- Confidence Intervals for the Mean (σ Known)
- Confidence Intervals for the Mean (σ Unknown)
- Confidence Intervals for Population Proportions
- Confidence Intervals for Variance and Standard Deviation
- **Marking Period 3 Review and Assessment**

Marking Period 4: Hypothesis Testing with One Sample, and Correlation and Regression

- Hypothesis Testing Basics
- Hypothesis Testing for the Mean (σ Known)
- Hypothesis Testing for the Mean (σ Unknown)
- Hypothesis Testing for Proportions
- Hypothesis Testing for Variance and Standard Deviation
- Correlation
- Linear Regression
- Measures of Regression and Prediction Intervals
- Multiple Regression
- **Marking Period 4 Review and Assessment**

Standards/Eligible Content and Skills

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Define: Population, Sample, Parameter, Statistics	S-IC.1, S-IC.2 S-IC.3	MP1
Distinguish between a population and a sample	S-IC.1, S-IC.2 S-IC.3	MP1
Distinguish between a sample and a statistic	S-IC.1, S-IC.2 S-IC.3	MP1
Distinguish between descriptive statistics and inferential statistics	S-IC.1, S-IC.2 S-IC.3	MP1
Distinguish between and identify data as qualitative and/or quantitative	S-IC.1, S-IC.2 S-IC.3	MP1
Classify data with respect to four levels of measurement: Nominal, Ordinal, Interval, Ratio	S-IC.1, S-IC.2 S-IC.3	MP1
Design a statistical study	S-IC.1, S-IC.2 S-IC.3	MP1
Distinguish between an observational study and an experiment	S-IC.1, S-IC.2 S-IC.3	MP1
Collect data by using a survey or a simulation	S-IC.1, S-IC.2 S-IC.3	MP1
Design an experiment	S-IC.1, S-IC.2 S-IC.3	MP1
Create a sample using random sampling, simple random sampling, stratified sampling, cluster sampling, systematic sampling	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Identify a biased sample	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Construct a frequency distribution including limits, midpoints, relative frequencies, cumulative frequencies, and boundaries	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Construct frequency histograms, frequency polygons, relative frequency histograms, and ogives	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Graph and interpret quantitative data sets using stem-and-leaf plots and dot plots	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Graph and interpret qualitative data sets using pie charts and Pareto charts	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Graph and interpret paired data sets using scatter plots and time series charts	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Find the mean, median, and mode of a population and of a sample	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Find a weighted mean of a data set	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Estimate the sample of mean grouped data	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Describe the shape of a distribution as symmetric, uniform, skewed and compare the mean and median for each distribution	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Find the range of a data set	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Find the variance and standard deviation of a population and of a sample	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Use the Empirical Rule and Chebyshev's Theorem to interpret standard deviation	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Estimate the sample standard deviation for grouped data	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Use the coefficient of variation to compare variation in different data sets	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Find the first, second, and third quartiles and interquartile range of a data set	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Represent a data set graphically using a box-and-whisker plot	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Calculate and interpret other fractiles, including percentiles, for a specific data entry	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Find and interpret the standard score (z score)	S-IC.4, S-IC.6 S-ID.2, S-ID.3 S-ID.5, S-ID.6	MP1
Marking Period 1 Review and Assessment		**MP1**
• Review and demonstrate knowledge of Statistical Introductory Basics		MP1
• Review and demonstrate knowledge of Descriptive Statistics		MP1
Identify the sample space of a probability experiment and simple events	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Use the Fundamental Counting Principle to find the number of ways two or more events can occur	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Distinguish among classical probability, empirical probability, and subjective probability	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Find the probability of the complement of an event	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Use a tree diagram and the Fundamental Counting Principle to find probabilities	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Find the probability of an event given that another event has occurred	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Distinguish between independent and dependent events	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Use the Multiplication Rule to find the probability of two or more events occurring in sequence	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Find conditional probabilities	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Determine whether two events are mutually exclusive	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Use the Addition Rule to find the probabilities of two events	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Find the number of ways a group of objects can be arranged in order and the number of ways to choose several objects from a group without regard to order	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Use counting principles to find probabilities	S-CP.0, S-CP.5 S-CP.6, S-CP.7 S-CP.8, S-MD.5a	MP2
Distinguish between discrete random variables and continuous random variables	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Construct and graph a discrete probability distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Determine whether a distribution is a probability distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Find the mean, variance, and standard deviation of a discrete probability distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Find the expected value of a discrete probability distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Determine whether a probability experiment is a binomial experiment	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Find the binomial probabilities using the binomial probability formula, a binomial probability table, and technology	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Construct and graph a binomial distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Find the mean, variance, and standard deviation of a binomial probability distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Find probabilities using geometric distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Find probabilities using Poisson distribution	S-CP.2, S-CP.3 S-CP.4, S-MD.6 S-MD.7, S-MD.5b	MP2
Marking Period 2 Review and Assessment		**MP2**
• Review and demonstrate knowledge of Probability		MP2
• Review and demonstrate knowledge of Discrete Probability Distributions		MP2
Interpret graphs of normal probability distributions	S-ID.4	MP3
Find areas under the standard normal curve	S-ID.4	MP3
Find probabilities for normally distributed variables using a table and using technology	S-ID.4	MP3
Find a z-score given the area under the normal curve	S-ID.4	MP3
Transform a z-score to an x-value	S-ID.4	MP3
Find a specific data value of a normal distribution given the probability	S-ID.4	MP3
Find sampling distributions and verify their properties	S-ID.4	MP3
Interpret the Central Limit Theorem	S-ID.4	MP3
Apply the Central Limit Theorem to find the probability of a sample mean	S-ID.4	MP3
Determine when a normal distribution can approximate a binomial distribution	S-ID.4	MP3
Find the continuity correction	S-ID.4	MP3

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Use a normal distribution to approximate binomial probabilities	S-ID.4	MP3
Find a point estimate and margin of error	S-IC.1, S-IC.4	MP3
Construct and interpret confidence intervals for a population mean when the standard deviation σ is known	S-IC.1, S-IC.4	MP3
Determine the minimum sample size requirement when estimating a population mean	S-IC.1, S-IC.4	MP3
Interpret the t-distribution and use a t-distribution table	S-IC.1, S-IC.4	MP3
Construct and interpret confidence intervals for a population mean when standard deviation σ is not known	S-IC.1, S-IC.4	MP3
Find a point estimate for a population proportion	S-IC.4, S-IC.5 S-IC.6	MP3
Construct and interpret confidence intervals for a population proportion	S-IC.4, S-IC.5 S-IC.6	MP3
Determine the minimum sample size required when estimating a population proportion	S-IC.4, S-IC.5 S-IC.6	MP3
Interpret the chi-square distribution and use a chi-square distribution table	S-IC.4, S-IC.5 S-IC.6	MP3
Construct and interpret confidence intervals for a population variance and standard deviation σ	S-IC.4, S-IC.5 S-IC.6	MP3
Marking Period 3 Review and Assessment		**MP3**
• Review and demonstrate knowledge of Normal Probability Distributions		MP3
• Review and demonstrate knowledge of Confidence Intervals		MP3
State a null hypothesis and alternate hypothesis	S-IC.4, S-IC.5 S-IC.6	MP4
Identify type I and type II errors and interpret the level of significance	S-IC.4, S-IC.5 S-IC.6	MP4
Know whether to use a one-tailed or a two-tailed statistical test and find a P-value	S-IC.4, S-IC.5 S-IC.6	MP4
Make and interpret a decision based on the results of a statistical test	S-IC.1, S-IC.4 S-IC.5, S-IC.6	MP4
Write a claim for a hypothesis test	S-IC.4, S-IC.5 S-IC.6	MP4
Find and interpret P-values	S-IC.4, S-IC.5 S-IC.6	MP4
Use P-values for a z-test for a mean μ when the standard deviation σ is known	S-IC.4, S-IC.5 S-IC.6	MP4
Find critical values and rejection regions in the standard normal distribution	S-IC.4, S-IC.5 S-IC.6	MP4

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Use rejection regions for a z-test for a mean μ when the standard deviation σ is known	S-IC.4, S-IC.5 S-IC.6	MP4
Find critical values in a t-distribution	S-IC.4, S-IC.5 S-IC.6	MP4
Use the t-test to test a mean μ when the standard deviation σ is not known	S-IC.4, S-IC.5 S-IC.6	MP4
Use technology to find P-values and use them with a t-test to test a mean μ when the standard deviation σ is not known	S-IC.4, S-IC.5 S-IC.6	MP4
Use the z-test to test a population proportion p	S-IC.4, S-IC.5 S-IC.6	MP4
Find the critical values for the chi-square test	S-IC.4, S-IC.5 S-IC.6	MP4
Use the chi-square test to test a variance σ^2 or a standard deviation σ	S-IC.4, S-IC.5 S-IC.6	MP4
Construct a scatter plot and find a correlation coefficient	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Test a population correlation coefficient p using a table	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Perform a hypothesis test for a population correlation coefficient p	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Find the equation of a regression line	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Predict y-values using the regression equation	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Find and interpret the coefficient of determination	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Find and interpret the standard error of estimate for a regression line	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Construct and interpret a prediction interval for y	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Use technology to find and interpret a multiple regression equation, the standard error of estimate, and the coefficient of determination	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Use a multiple regression equation to predict y-values	S-ID.6, S-ID.7 S-ID.8, S-ID.9	MP4
Marking Period 4 Review and Assessment		**MP4**
• Review and demonstrate knowledge of Hypothesis Testing with One Sample		MP4
• Review and demonstrate knowledge of Correlation and Regression		MP4

ASSESSMENTS

PDE Academic Standards, Assessment Anchors, and Eligible Content: The teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

Formative Assessments: The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

Effective formative assessments for this course include:
Suggested but not limited to:

- Pre-assessments of prior knowledge (e.g., Entrance cards or KWL chart)
- Bellringers/Problems of the Day (PODs)
- Discussions
- Exit ticket
- Teacher observations/Questioning
- Graphic organizers (e.g., Venn Diagrams, word mapping, webbing, KWL chart, etc.)
- Outlining
- Cooperative learning
- Written work
- Quizzes
- Oral response
- Self-evaluation
- Homework
- Summarizing
- Note-taking

Summative Assessments: The teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

Effective summative assessments for this course include:
Suggested but not limited to:

- Performance assessment
- Chapter/unit tests
- Quizzes
- Marking period assessments
- Projects
- Student presentations