Hamburg Area School District

Course Guide

Name:	Probability and Statistics
Grade(s):	*12*
Length:	*Place an X next to the correct option*
X	Full-Year (180 Sessions)
	Semester (90 Sessions)
	Quarter (45 Sessions)
	Other (Specify):
Text:	Brace, Charles H. *Understanding Statistics: Concepts and Methods.* 11th Edition. 2015
Approved on:	2007-2008 (Reviewed 2021-2022)

Description:

This course surveys the use of statistics and the impact statistics have on the world around us. Probability as a tool for generating statistics is discussed. Students discover how to use statistics to make decisions and how statistics can be misused. By utilizing realistic hands-on situations and simulations, students experience practical and useful applications of statistical principles. This course is designed as an elective primarily for seniors and is useful for both career prep and college prep students. Juniors may take this course only if they are also enrolled in a required course at the same time.

Probability and Statistics

Unit: The Nature of Probability and Statistics
Unit Length: *1 Week*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Statistical Terms	Define statistical terms.	2.6.11
Data Terms	Differentiate between descriptive and inferential statistics. Identify types of data. Identify levels of measurement.	2.6.11
Sample Terms	Identify the four basic sampling techniques.	2.6.11.A 2.6.11.E
Types of Studies	Identify observational and experimental studies. Differentiate between independent and dependent variables. Differentiate between treatment and control groups.	2.6.11.G

Probability and Statistics

Unit: Organizing Data
Unit Length: *3 Weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Frequency Distributions	Create categorical frequency distributions. Create ungrouped frequency distributions. Be able to use class vocabulary (class limits, class boundaries, class width, and class midpoint). Create grouped frequency distributions. Create cumulative frequency distributions.	M11.E.1.1.1 M11.E.1.1.2
Grouped Frequency Distribution Graphs	Create histograms. Create frequency polygons. Create ogives.	M11.E.1.1.1 M11.E.1.1.2
Other Graphs	Create Pareto charts. Create time series graphs. Create pie graphs.	M11.E.1.1.1 M11.E.1.1.2

Probability and Statistics

Unit: Data Description
Unit Length: *7 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
General Rules	Differentiate between a statistic and a parameter. Be able to use the general rounding rule. Identify different shapes of distributors.	2.6.11.a
Measures of Central Tendency	Calculate the mean. Calculate the median. Calculate the mode. Calculate the midrange. Calculate a weighted mean. Calculate the mean for a frequency distribution.	M11.E.2.1.1 M11.E.2.1.3
Measures of Variation	Calculate the range. Calculate the variance and standard deviation for a population. Estimate the variance and standard deviation for a sample. Calculate the variance and standard deviation for a frequency distribution. Calculate the coefficient of variation.	M11.E.2.1.2

Theorems about Variation	Calculate intervals or percentages based on Chebyshev's theorem. Calculate intervals or percentages based on the Empirical Rule.	2.6.11.A
Measures of Position	Calculate standard scores (z-scores). Calculate percentiles for a score. Create percentile graphs from a frequency distribution. Calculate quartiles and deciles. Find outliers.	M11.E.2.1.2 M11.E.2.1.3
Exploratory Data Analysis	Create stem-and-leaf plots. Find the five-number-summary. Create boxplots. Create modified boxplots.	M11.E.1.1.1 M11.E.1.1.2 2.6.11.B

Probability and Statistics

Unit: Counting Techniques
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Tree Diagrams	Create tree diagrams given a sequence of events. Use the multiplication principle to find the total number of outcomes without doing a tree diagram.	2.6.11.A
Permutations and Combinations	Calculate the number of ways something can be arranged (permutations). Calculate the number of ways something can be grouped (combinations). Be able to decide when to use permutations and combinations.	M11.3.2.1 2.7.11.C

Probability and Statistics

Unit: Probability
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Probability Definitions	Define an event, outcome, and sample space. Differentiate between classical, empirical, and subjective probability. Identify an event as likely or unlikely based on its probability.	M11.3.1.1 2.7.11.C
Calculating Probability	Find the probability of a simple event using classical probability. Find the probability of a simple event using empirical probability.	M11.3.1.1
Addition Rules	Find the probability of two mutually exclusive events. Find the probability of two events that are not mutually exclusive.	M11.3.1.1 2.6.11.F
Multiplication Rules	Find the probability of two independent events. Find the probability of two dependent events. Find the conditional probability of a second even given the probability of the first and the probability of both.	M11.3.1.1 2.6.11.F 2.7.11.C
Probability and Counting Techniques	Find the probability of simple events using counting techniques. Find the probability of compound events using counting techniques.	M11.3.1.1 M11.3.1.2

Probability and Statitistics

Unit: Discrete Probability Distributions

Unit Length: *2 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Probability Distributions	Construct a probability distribution. Construct a probability distribution graph. Find the mean, variance, and expectation given a probability distribution	M11.#.1.1.1
Binomial Distributions	Be able to state an event in terms of binomial distribution vocabulary (trials, successes, experiment…). Calculate the probability of a binomial experiment using the binomial probability formula. Use the binomial experiment table to calculate the probability of a binomial experiment. Find the mean, variance, and expectation for a binomial distribution.	M11.E.3.1.1 M11.E.2.1.1 2.7.11.C 2.7.11.D
Other Distributions	Use geometric, poisson, and poisson approximation. Calculate probability. Find the expected value and X.	

Probability and Statitistics

Unit: Normal Distribution
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Properties of the Normal Distribution	Identify distributions as symmetrical or skewed. Identify the properties of the normal distribution. Know the mean and standard deviations of the standard normal distribution.	2.6.11.I 2.6.11.D
Applications of the Normal Distribution	Find area under the standard normal distribution, given various z-scores. Find probability for a normally distributed variable by transforming it into area under the curve. Find a z-score given an area under the normal distribution. Find a data value given a percentage of scores that are greater or less than it.	2.6.11.I 2.6.11.D 2.7.11.C 2.7.11.D
Central Limit Theorem	Know when to apply the central limit theorem. Calculate probabilities of an event using the central limit theorem.	2.6.11.I
Normal Approximation of the Binomial Distribution	Know when to apply binomial approximation. Calculate the probability of a binomial experiment using normal approximation.	2.6.11.I 2.7.11.C 2.7.11.D

Probability and Statitistics

Unit: Confidence Intervals
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Z Confidence Intervals for Means	Know when to use z confidence intervals. Calculate z confidence intervals. Determine the sample size necessary for a specific confidence level and margin of error.	2.6.11.A 2.6.11.I 2.6.11.H 2.7.11.B
T Confidence Intervals for Means	Know when to use t confidence intervals. Calculate t confidence intervals.	2.6.11.A 2.6.11.I 2.7.11.D
Confidence Intervals for Proportions	Know when to use confidence intervals for proportions. Calculate confidence intervals for proportions. Determine the sample size necessary for a specific confidence level and margin of error.	2.6.11.A 2.6.11.I 2.6.11.H 2.7.11.B
Confidence Intervals for Standard Deviation and Variance	Know when to use confidence intervals for standard deviation or variance. Calculate confidence intervals standard deviation and variance.	2.6.11.A 2.6.11.I 2.6.11.D 2.7.11.D

Probability and Statitistics

Unit: Hypothesis Testing
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Steps in the Traditional Method of Hypothesis Testing	Use the terms in hypothesis testing. State null and alternative hypotheses and label which is the claim. Describe the steps of the traditional method of hypothesis testing.	2.6.11.A. 2.6.11.I 2.7.11.B 2.7.11.C 2.7.11.D
Z Test for a Mean	Know when to use a z test for a mean. Find critical values for a z test. Perform a z test for a mean.	2.6.11.A 2.6.11.I 2.7.11.B 2.7.11.C 2.7.11.D
T Test for a Mean	Know when to use a t test for a mean. Find critical values for a t test. Perform a t test for a mean.	2.6.11.A 2.6.11.I 2.7.11.B 2.7.11.C 2.7.11.D
Z Test for a Proportion	Know when to use a z test for a proportion. Perform a z test for a proportion.	2.6.11.A 2.6.11.I 2.7.11.B 2.7.11.C 2.7.11.D
Chi-Square Test for a Standard Deviation or Variance	Know when to use a chi-square test. Find critical values for a chi-square test. Perform a chi-square test.	2.6.11.A 2.6.11.I 2.7.11.B 2.7.11.C 2.7.11.D 2.6.11.I

Other Methods of Tests	Use a calculator to perform hypothesis tests using the p-value method. Use the confidence interval method to perform two-tailed hypothesis tests with and without a calculator.	2.6.11.A 2.6.11.I 2.7.11.B

Probability and Statitistics

Unit: Two Sample Hypothesis Tests
Unit Length: *4 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Two Sample Z Tests for Means	Know when to use two sample z tests for means. Perform two sample z tests for means.	2.6.11.A 2.6.11.I 2.6.11.H
Two Sample F tests for Variances	Know when to use two sample f tests for variances or standard deviations. Perform two sample f tests for variances or standard deviations.	2.6.11.A 2.6.11.I 2.6.11.H
Two Sample T Tests for Means from Small Independent Samples	Know when to use each t test. Perform f tests to decide when to use each t test. Perform t tests of the means for two small independent samples.	2.6.11.A 2.6.11.I 2.6.11.H
Two Sample T Tests for Means from Small Dependent Samples	Know when to use t tests fo two small dependent samples. Calculate values of the new statistics necessary for t tests of dependent samples. Perform t tests of the means for two small dependent samples.	2.6.11.A 2.6.11.I 2.6.11.H
Two Sample Z Test for Proportions	Know when to use two sample z tests for proportions. Perform two sample z tests for proportions.	2.6.11.A 2.6.11.I 2.6.11.H

Probability and Statitistics

Unit: Correlation and Regression
Unit Length: *3 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Correlation and Regression Vocabulary	Describe the difference between correlation and regression. Estimate correlation coefficients.	2.6.11.F
Calculate Correlation and Regression	Graph a scatterplot and draw a line of regression by hand. Graph a scatterplot and find the correlation coefficient and regression equation. Test a correlation to see if it is strong. Make predictions using the regression equation.	M11.E.1.1.1 M11.E.1.1.2 M11.E.4.2.1 M11.E.4.2.2 2.6.11.F 2.7.11.C