



Washington Township School District



The mission of the Washington Township Public Schools is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.

Course Title:	CP Statistics					
Grade Level(s):	12					
Duration:	Full Year:	X	Semester:		Marking Period:	
Course Description:	Statistics is a five-credit elective academic mathematics course for those seniors who have successfully completed Algebra II. This course will focus on the application of skills learned as they apply to the real - world. Emphasis is placed on data collection and simulations to introduce statistical concepts and to enhance the learning and understanding of statistical research techniques. Four broad conceptual themes are covered: Descriptive Statistics, Probability and Probability Distributions, Statistical Inference, and more Statistical Inference. This course involves considerable use of technology in analyzing data. Technology tools include the use of graphing calculators and computer software.					
Grading Procedures:	The final grade will be a composite of quiz scores, test scores, homework, and participation reflecting the student's mastery of the above skills. The student can pass the course with an overall grade of a seventy percent or better. The grading system will be explained to the student by the classroom teacher.					
Primary Resources:	Understandable Statistics, Concepts and Methods 12E textbook					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Patricia Tsoukalis & Natalie Taylor
Under the Direction of:	Dr. Carole English

Written: July 2022

Revised: _____

BOE Approval: _____

Unit Title: 1 Getting Started	
Unit Description: The introduction to statistics will define statistics and introduce the students to the vocabulary needed throughout the course. It introduces data and provides methods for collecting it.	
Unit Duration: 6 - 9 days	
Desired Results	
Standard(s): S-IC B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	
Indicators: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	
Understandings: <i>Students will understand that...</i> - There are two main branches of statistics: descriptive and inferential - There are different types of data - You can collect data and design an experiment	Essential Questions: - Why is statistics important? (1.1) - What is the nature of data? (1.2) - How can you draw a random sample? (1.2) - What are other sampling techniques? (1.2) - How can you design ways to collect data? (1.3)
Assessment Evidence	
Performance Tasks: Students will be able to... - Explain the difference between an experiment and an observation. - Determine if there is a control group or a treatment group. - Identify the variable in the study. - Determine the level of measurement. - Compare descriptive and inferential statistics - Construct simple random sample using random numbers - Simulate a random process - Describe stratified sampling, cluster sampling, systematic sampling, multistage sampling, and convenience sampling - Describe simulations, observational studies, and experiments - Identify control groups, placebo effects, completely randomized experiments, and randomized block experiments - Discuss potential pitfalls that might make data unreliable	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 1 - Class activities - Computer assignments

Benchmarks:

Unit 1 Test

Learning Plan**Learning Activities:**

Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com

Chapter 1 Getting Started

1.1 What is Statistics?

1.2 Random Samples

1.3 Introduction to Experimental Design

Resources:

Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 1

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively

8.1.8.DA.4: Transform data to remove errors and improve the accuracy of the data for analysis.

HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking and creativity.

Unit Title: 2 Organizing Data	
Unit Description: Data will be organized and graphed in different types of graphs.	
Unit Duration: 5 - 7 days	
Desired Results	
Standard(s): S-ID A: Summarize, represent, and interpret data on a single count or measurement variable	
Indicators: 1: Represent data with plots on the real number line (dot plots, histograms, and box plots).	
Understandings: <i>Students will understand that...</i> • They can organize data in a frequency table and use it to graph the distribution • There are different ways to display data	Essential Questions: 1. What are histograms? When are they used? (2.1) 2. What are the common distribution shapes? (2.1) 3. How can you select graphs appropriate for given data sets? (2.2) 4. How can you quickly order data and, at the same time, reveal the distribution shape? (2.3)
Assessment Evidence	
Performance Tasks: Students will be able to: • Organize raw data using a frequency table. • Construct histograms, relative-frequency histograms, and ogives. • Recognize basic distribution shapes: uniform, symmetric, skewed, and bimodal. • Interpret graphs in context of the data setting. • Determine appropriate graph for given data • Construct bar graphs, Pareto charts, circle graphs, time-series graphs, and step-and-leaf displays • Interpret information displayed in graphs	Other Evidence: • Class Participation • Teacher Observation • Quiz Ch 2 • Class activities • Computer assignments • Excel Project
Benchmarks: Unit 2 Test	
Learning Plan	

Learning Activities:

Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com, Skittles/M&M lab, Excel Project

Chapter 2 Organizing Data

2.1 Frequency Distributions, Histograms, and Related Topics

2.2 Bar Graphs, Circle Graphs, and Time-Series Graphs

2.3 Stem and Leaf Displays

Resources:

Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 2

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking, collaboration, and communication.

Unit Title: 3 Averages and Variation	
Unit Description: Students will learn how to calculate central measures of tendency and variation.	
Unit Duration: 6 - 9 days	
Desired Results	
Standard(s): S-ID.A Summarize, represent, and interpret data on a single count or measurement variable	
Indicators: 2 – 4: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	
Understandings: <i>Students will understand that...</i> • They can calculate the central measures of tendency and use the calculations to make statements about the data. • They can calculate the variation of the data and make statements about the data.	Essential Questions: 1. What are commonly used measures of central tendency? What do they tell you? (3.1) 2. How do variance and standard deviation measure data spread? Why is this important? (3.2) 3. How do you make a box-and-whisker plot, and what does it tell you about the spread of the data? (3.3)
Assessment Evidence	
Performance Tasks: Students will be able to: • Compute mean, median, and mode from raw data. • Interpret mean, median, and mode. • Explain how mean, median, and mode can be affected by extreme data values. • Identify a trimmed mean and calculate it. • Compute a weighted average. • Calculate range, variance, standard deviation, coefficient of variation • Apply Chebyshev's theorem to raw data • Interpret percentile scores • Compute median, quartiles, and five-number summary • Make a box-and-whisker plot and interpret results • Describe how box-and-whisker plot indicates spread of data about the mean	Other Evidence: • Class Participation • Teacher Observation • Quiz Ch 3 • Class activities • Computer assignments

Benchmarks:

Unit 3 Test

Learning Plan**Learning Activities:**

Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com, Skittles/M&M lab

Chapter 3 Averages and Variation

3.1 Measures of Central Tendency: Mode, Median, and Mean

3.2 Measures of Variation

3.3 Percentiles and Box and Whisker Plots

Resources:

Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 3

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking, collaboration, and communication.

Unit Title: 4 Elementary Probability Theory	
Unit Description: Introduction to the concept of probability	
Unit Duration: 14 - 18 days	
Desired Results	
Standard(s): S-CP A – B Understand independence and conditional probability and use them to interpret data. Use the rules of probability to compute probabilities of compound events in a uniform probability model. Use the rules of probability to compute probabilities of compound events in a uniform probability model	
Indicators: A 1- 3, 5 1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). 2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent. 3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A , and the conditional probability of B given A is the same as the probability of B . 5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. <i>For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.</i>	
B 6 – 9 6. Find the conditional probability of A given B as the fraction of B 's outcomes that also belong to A and interpret the answer in terms of the model. 7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ and interpret the answer in terms of the model. 8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)$ and interpret the answer in terms of the model. 9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.	
Understandings: <i>Students will understand that...</i> • There are rules for probability: multiplication rules, addition rules • There are differences between dependent and independent events • There are other methods used to calculate probability	Essential Questions: • Why would anyone study probability? (Most big issues in life involve uncertainty.) (4.1) • What are the basic definitions and rules of probability? (4.2) • What are the counting techniques, trees, permutation, and combinations? (4.3)
Assessment Evidence	
Performance Tasks: Students will be able to... • Assign probabilities to events • Explain how the law of large numbers relates to relative frequencies • Apply basic rules of probability in everyday life • Explain the relationship between statistics and probability	Other Evidence: • Class Participation • Teacher Observation • Quiz Ch 4 • Class activities • Computer assignments

• Compute probabilities involving independent events or mutually exclusive events • Use survey results to compute conditional probabilities • Organize outcomes in a sample space using tree diagrams • Compute number of ordered arrangements of outcomes using permutations and nonordered groupings using combinations • Explain how counting techniques relate to probability in everyday life	
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Benchmarks:

Unit 4 test

Learning Plan

Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com, Skittles/M&M lab

Chapter 4 Elementary Probability Theory

4.1 What is Probability

4.2 Some Probability Rules-Compound Events

4.3 Trees and Counting Techniques

Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 4

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking, collaboration, and creativity.

Unit Title: 5 The Binomial Probability Distribution	
Unit Description: Introduction to the concepts of discrete and continuous random variables	
Unit Duration: 7 - 10 days	
Desired Results	
Standard(s): S-MD A 3 – 4 Calculate expected values and use them to solve problems	
Indicators: 3 – 4: Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically.	
Understandings: <i>Students will understand that...</i> - Discrete probability distributions are used to determine the probability of outcomes from a binomial experiment - There are many probability experiments for which the results of each trial can be reduced to two outcomes: success and failure - You can find probabilities using geometric and Poisson distribution	Essential Questions: - What is a random variable? (5.1) - How do you compute mean and standard deviation for a discrete random variable or linear combinations of independent random variables? (5.1) - How can you use the binomial probability distribution to compute the probability of r successes? (5.2) - How do you compute the mean and standard deviation for the binomial distribution? (5.3) - How is the binomial distribution related to other probability distributions, such as geometric and Poisson? (5.4)
Assessment Evidence	
Performance Tasks: - Distinguish between discrete and continuous random variables - Graph discrete probability distributions - Compute mean and standard deviation for discrete probability distribution and for a linear function of a random variable - List the defining features of a binomial experiment - Compute binomials using the formula, table, or graphing calculator - Use the binomial probability distribution to solve real-world applications - Make histograms for binomial distributions - Compute mean and standard deviation for a binomial distribution - Compute the minimum number of trials needed to achieve a given probability of success - Use the geometric distribution to compute the probability that the n^{th} trial is the first success	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 5 - Class activities - Computer assignments

• Use the Poisson distribution to compute the probability of the occurrence of events spread out over time or space • Use the Poisson distribution to approximate the binomial distribution when the number of trials is large, and the probability of success is small	
Benchmarks: Unit 5 test	
Learning Plan	
Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com Chapter 5 The Binomial Probability Distribution and Related Topics 5.1 Introduction to Random Variables and Probability Distributions 5.2 Binomial Probabilities 5.3 Additional Properties of the Binomial Distribution 5.4 The Geometric and Poisson Probability Distributions Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 5	

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking.

Unit Title: 6 Normal Curves and Sampling Distribution	
Unit Description: Examination of graphs of normal distributions, control charts, standard units, z scores, and area under the standard normal curve	
Unit Duration: 15 - 20 days	
Desired Results	
Standard(s): S-IC B 4: Make inferences and justify conclusions from sample surveys, experiments, and observational studies. S-ID A 4: Summarize, represent, and interpret data on a single count or measurement variable	
Indicators: B4: Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. A4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	
Understandings: <i>Students will understand that...</i> - A normal distribution with mean and standard deviation can be transformed into the standard normal distribution. - You can find probabilities for normal distributed variables using a table and technology. - You can find a z-score given the area under the normal curve.	Essential Questions: - What are some characteristics of a normal distribution? (6.1) - What does the empirical rule tell you about the data spread around the mean? (6.1) - How can this information be used in quality control? (6.1) - What are a standard normal distribution and a standard z score? (6.2) - How do you convert any normal distribution to a standard normal distribution? (6.3) - How do you find probabilities of “standardized events”? (6.3) - What is a probability sampling distribution? (6.4) - How will sampling distributions help us make good decisions based on incomplete information? (6.4) - How can we take advantage of the fact that all probability distributions average out to be normal distributions as we study sampling distributions? (6.5) - How can you apply these concepts in the real world? (6.6) - What is the probability sampling distribution for proportions? (6.6)
Assessment Evidence	
Performance Tasks: Students will be able to: - Graph a normal curve and summarize its important properties. - Apply the empirical rule to solve real-world problems.	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 6 - Class activities - Computer assignments

- Use control limits to construct control charts.
- Examine the chart for three possible out-of-control signals.
- Given a mean and standard deviation, convert raw data to z scores and z scores to raw data.
- Graph the standard normal distribution and find areas under the standard normal curve.
- Compute the probability of “standardized events”.
- Find a z score from a given normal probability (inverse normal).
- Use the inverse normal to solve guarantee problems.
- Construct a relative frequency distribution for sample mean values and compare the result to a theoretical sampling distribution
- Use the mean and standard deviation to construct the theoretical sampling distribution for the statistic mean.
- For large samples, use sample estimates to construct a good approximate sampling distribution for the statistic mean.
- Understand the central limit theorem
- State the assumptions needed to use the normal approximation to the binomial distribution
- Compute mean and standard deviation for the normal approximation.
- Use the continuity correction to convert a range of r values to a corresponding range of normal x values.
- Convert the x values to a range of standardized z scores and find desired probabilities
- Describe the sampling distributions for proportions

Benchmarks:

Unit 6 Test

Learning Plan

Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com

Chapter 6 Normal Curves and Sampling Distributions

Part I Normal Distributions

6.1 Graphs of Normal Probability Distributions

6.2 Standard Units and Areas Under the Standard Normal Distribution

6.3 Areas Under Any Normal Curve

Part II Sampling Distributions and the Normal Approximation to Binomial Distribution

6.4 Sampling Distributions

6.5 The Central Limit Theorem

6.6 Normal Approximations to Binomial Distribution and the p Distribution

Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 6

Unit Modifications for Special Population Students

Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections

Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Integration of 21st Century Skills

Indicators:

From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking and communication.

Unit Title: 7 Estimation	
Unit Description: Problems of statistical inference require you to draw a random sample of observations from a larger population. A sample usually contains incomplete information. Conclusions about the population can be obtained from sample data by using statistical estimates. This chapter introduces several widely used methods of estimation.	
Unit Duration: 8 – 12 days	
Desired Results	
Standard(s):	
Indicators:	
Understandings: <i>Students will understand that...</i> - A point estimate is a single value estimate for a population parameter. - A t-distribution can be used when the standard deviation is not known. - A population proportion is the probability of success in a single trial of a binomial experiment. - A Chi-square distribution is used to construct a confidence interval for the variance and standard deviation.	Essential Questions: - How do you estimate the expected value of a random variable? What assumptions are needed? How much confidence should be placed in such estimates? (7.1) - How large a sample size should you plan to get for a statistical study? (7.1) - How do you construct estimates from sample data? (7.2) - How do you estimate the proportion of successes in a binomial experiment? How does the normal approximation fit into this process? (7.3)
Assessment Evidence	
Performance Tasks: Students will be able to: - Explain the meanings of confidence level, error of estimate, and critical value. - Find the critical value corresponding to a given confidence level. - Compute confidence intervals for the mean when the population standard deviation is known and interpret the results. - Compute the sample size to be used for estimating a population mean. - Find critical values using degrees of freedom and confidence levels. - Compute confidence intervals for the population mean when the population standard deviation is unknown. - Compute the maximum margin of error for proportions using a given level of confidence. - Compute confidence intervals for p and interpret the results. - Interpret poll results. - Compute the sample size to be used for estimating a proportion when we have an estimate for p.	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 7 - Class activities - Computer assignments

• Compute the sample size to be used for estimating a proportion when we have no estimate for p.	
Benchmarks: Unit 7 Test	
Learning Plan	
Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com Chapter 7 Estimation Part I Estimating a Single Mean or Single Proportion 7.1 Estimating Population Mean When Population Standard Deviation is Known 7.2 Estimating Population Mean When Population Standard Deviation is Unknown 7.3 Estimating p in the Binomial Distribution Part II Estimating the Difference Between Two Means or Two Proportions 7.4 Estimating $\mu_1 - \mu_2$ and $p_1 - p_2$ Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 7	

Unit Modifications for Special Population Students	
Advanced Learners	Complete Extension Activities, Complete Critical Thinking Exercises, Ask Reflective/Extension Questions
Struggling Learners	Read problems aloud frequently, rephrase problems, Preferential seating, provide step by step solutions, provide study guides
English Language Learners	Read problems aloud frequently, rephrase problems, allow use of translating device, provide study guides, preferential seating, allow access to language dictionary, help interpret any language/communication difficulties
Special Needs Learners	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in IEP
Learners with a 504	Read problems aloud frequently, rephrase problems, provide study guides, any modifications listed in 504

Interdisciplinary Connections
Indicators: RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. 2.3.12.HCDM.5: Analyze local, state, and international public health efforts to prevent and control diseases and health conditions (e.g., vaccinations, immunizations, medical exams, gene editing, artificial organ systems, prosthesis).

Integration of 21 st Century Skills
Indicators: <i>From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking and communication.</i>

Unit Title: 8 Hypothesis Testing	
Unit Description: This unit continues the study of inferential statistics: Identify null and alternate hypothesis, identify Type I and II errors, perform one-tailed and two-tailed tests, interpret a decision based on results of the hypothesis tests, find and interpret p-values, find critical values and rejection regions, use a t-test to test a mean, use P-values for a z-test for a mean, use a z-test to test a population proportion, find critical values for a chi-square test, and use the chi-square test to test a variance or a standard deviation.	
Unit Duration: 12 – 17 days	
Desired Results	
Standard(s):	
Indicators:	
Understandings: <i>Students will understand that...</i> - A hypothesis test is a process that uses sample statistics to test a claim about the value of a population parameter. - A z-test can be used for a proportion. - A Chi-squared distribution can be used to test variance and standard deviation.	Essential Questions: - How do you decide whether to accept or reject a proposal? (8.1) - What is the P-value of a statistical test? What does this measurement have to do with performance reliability? (8.1) - How do you construct statistical tests for population mean? Does it make a difference whether the population standard deviation is known or unknown? (8.2) - How do you construct statistical tests for the proportion of successes in a binomial experiment? (8.3)
Assessment Evidence	
Performance Tasks: Students will be able to: - Understand the rationale for statistical tests. - Identify the null and alternate hypotheses in a statistical test. - Identify right-tailed, left-tailed, and two-tailed tests. - Use a test statistic to compute a P-value. - Recognize types of errors, level of significance, and power of a test. - Understand the meaning and risks of rejecting or not rejecting the null hypothesis. - Test population mean when the population standard deviation is known using the normal distribution. - Test the population mean when the population standard deviation is unknown using a t-distribution. - Understand the traditional method of testing that uses critical regions and critical values instead of P-values.	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 8 - Class activities - Computer assignments

- Identify the components needed for testing a proportion.
- Compute the sample test statistic.
- Find the P-value and conclude the test.

Benchmarks:

Unit 8 Test

Learning Plan

Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com

Chapter 8 Hypothesis Testing

Part I Testing a Single Mean or Single Proportion

8.1 Introduction to Statistical Tests

8.2 Testing the Mean

8.3 Testing a Proportion

Part II Testing a Difference Between Two Means or Two Proportions

8.4 Tests Involving Paired Differences

8.5 Testing $\mu_1 - \mu_2$ and $p_1 - p_2$

Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 8

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Interdisciplinary Connections
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Integration of 21 st Century Skills
Indicators: <i>From the Partnership for 21st Century Skills (P21), the deeper learning competencies and skills for 21st century learning in this unit include critical thinking, communication, and creativity.</i>

Unit Title: 9 Correlation and Regression	
Unit Description: This unit will study how to describe and test the significance of relationships between two variables when data is presented as ordered pairs: correlation, linear regression, measures of regression and prediction intervals, and multiple regression.	
Unit Duration: 9 – 13 days	
Desired Results	
Standard(s):	
Indicators:	
Understandings: <i>Students will understand that...</i> - A correlation coefficient is a measure of the strength between two variables. - There are three types of variation: total variation, explained variation, and unexplained variation.	Essential Questions: - How can you use a scatter diagram to visually estimate the degree of linear correlation of two random variables? (9.1) - How do you compute the correlation coefficient and what does it tell you about the strength of the linear relationship between two random variables? (9.1) - What is the least-squares criterion? How do you find the equation of the least-squares line? (9.2) - What is the coefficient of determination and what does it tell you about explained variation of y in a random sample of data pairs (x, y)? (9.2) - How do you determine if the sample correlation coefficient is statistically significant? (9.3) - How do you find a confidence interval for predictions based on the least squares model? (9.3)
Assessment Evidence	
Performance Tasks: Students will be able to: - Make a scatter diagram. - Use sample data to compute the sample correlation coefficient r. - Investigate the meaning of the correlation coefficient r. - State the least squares criterion. - Use the sample data to find the equation of the least squares line. Graph the least squares line. - Use the least squares line to predict a value of the response variable y for a specified value of the explanatory variable x. - Explain the difference between interpolation and extrapolation. - Explain why extrapolation beyond the sample data range might give results that are misleading or meaningless. - Use r squared to determine explained and unexplained variation of the response variable y.	Other Evidence: - Class Participation - Teacher Observation - Quiz Ch 9 - Class activities - Computer assignments

• Test the correlation coefficient. • Use the sample data to compute the standard error of estimate. • Find a confidence interval for the value of y predicted for a specified value of x. • Test the slope of the least squares line. • Find a confidence interval for the slope of the least squares line and interpret its meaning.	
Benchmarks: Unit 9 Test	
Learning Plan	
Learning Activities: Lectures delivered through Edpuzzle, class assignments, class activities, computer assignments available through cengage.com, Linear regression Excel project Chapter 9 Correlation and Regression Part I Simple Linear Regression 9.1 Scatter Diagrams and Linear Correlation 9.2 Linear Regression and the Coefficient of Determination 9.3 Inferences for Correlation and Regression Part II Multiple Regression 9.4 Multiple Regression Resources: Understandable Statistics: Concepts and Methods, 12th Edition, Chapter 9	

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WHST.11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

SL.11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).

6.1.12.EconNE.3.a: Evaluate the impact of education in improving economic opportunities and in the development of responsible citizens.

Integration of 21st Century Skills

Indicators:

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