Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Introduction to Statistics	
In this unit, students will define: data, statistics, population, sample, parameter, statistic, descriptive statistics, inferential statistics, quantitative data, qualitative data, nominal data, ordinal data, interval data, ratio data, observational study, experiment, treatment, treatment group, control group, experimental units, placebo, simulation, survey, confounding variable, placebo effect, blinding, randomization, completely randomized design, blocks, randomized block design, matched pairs design, sample size, replication, census, sampling, sampling error, random sample, SRS, stratified sampling, cluster sample, systematic sample, convenience sample.	
Essential Questions	**Learning Targets/Objectives**
1. What is statistics? 2. What is a population? 3. What is a sample? 4. What is a parameter vs. a statistic? 5. What is descriptive vs. inferential statistics? 6. What is the difference between qualitative and quantitative data? 7. How do you classify data based on the level of measurement? 8. How do you design a statistical study? 9. What's the difference between an observational study and an experiment? 10. How do you collect data?	Students will be able to: • Determine which part of a study represents descriptive statistics • Describe what conclusions can be drawn using inferential statistics • Classify data sets as a population or sample • Identify a parameter versus a statistic • Identify qualitative versus quantitative data • Identify whether a data set is nominal or ordinal • Identify whether a data set is interval or ratio level • Determine whether a study is an observational or experimental study • Evaluate and improve upon experimental designs • Use randomization to select a sample

11. How do you design an experiment? 12. How do you collect a sample?	• Use appropriate sampling techniques • Discuss potential sampling bias
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Experiments, Observational Studies, Qualitative, Quantitative	Stratified Sampling, Cluster Sampling, Convenience Sampling, Systematic Sampling, Nominal Data, Ordinal Data, Interval Data, Ratio Data

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-IC.A.1 2. S-IC.A.2 3. S-IC.B.3	1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. 2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. 3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1 2. SL.II.11–12.2	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively,

	orally) evaluating the credibility and accuracy of each source.
3. SL.PI.11–12.4	3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-ESS3-1	5. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.CT.3	2. Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
3. 9.4.12.IML.2	3. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
4. 9.4.12.IML.3	4. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
5. 9.4.12.IML.8	5. Evaluate media sources for point of view, bias, and motivations.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
2. 8.1.12.DA.2	2. Describe the trade-offs in how and where data is organized and stored.
3. 8.1.12.DA.4	3. Explain the relationship between binary numbers and the storage and use of data in a computing device.
4. 8.1.12.DA.5	4. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
5. 8.1.12.DA.6	5. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions

- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions

- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

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- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources
Textbook
Elementary Statistics - Picturing the World (Larson, Farber) Edition 6e
Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources

- Multi-Language Glossary

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: Section 1.1 An Overview of Statistics	
Specific Learning Objective	**Practice & Apply Exercises**
• Determine which part of a study represents descriptive statistics • Describe what conclusions can be drawn using inferential statistics • Classify data sets as a population or sample • Identify a parameter versus a statistic	1-43 odd

Section Number & Title: Section 1.2 Data Classification	
Specific Learning Objective	**Practice & Apply Exercises**
• Identify qualitative versus quantitative data • Identify whether a data set is nominal or ordinal • Identify whether a data set is interval or ratio level	1-31 odd

Section Number & Title: Section 1.3 Data Collection and Experimental Design	
Specific Learning Objective	**Practice & Apply Exercises**
• Determine whether a study is an observational or experimental study • Evaluate and improve upon experimental designs • Use randomization to select a sample • Use appropriate sampling techniques	Day 1: 1-21 odd Day 2: 23-37 odd

• Discuss potential sampling bias	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. • Diagnostic Pre-Test • Chapter Tests • Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: • Teacher observations • Self-Assessments • Student record-keeping • Quizzes • Warm-ups • Exit Tickets • Participation in class discussions • Independent practice	The following assessments require students to utilize various strands of mathematics. • Projects • Performance Tasks • Homework • Classwork
List of Accommodations and Modifications • Special Education • 504 Students • At Risk Students • MLL • Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

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Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: 2.1-2.2 DESCRIPTIVE STATISTICS USING GRAPHS

In this unit, students will explore various methods for organizing and visually representing data. They will learn how to construct frequency distributions from a data set and represent these distributions using frequency histograms and cumulative frequency graphs. The unit will also cover additional data visualization techniques, including stem-and-leaf plots, dot plots, pie charts, Pareto charts, scatter plots, and time series charts. Students will analyze relationships in scatter plots by identifying and calculating the line of best fit. By the end of the unit, students will be proficient in interpreting and creating a variety of charts and graphs to effectively represent and analyze data.

Essential Questions	Learning Targets/Objectives
1. What is a frequency distribution? 2. What is a frequency histogram? 3. How do I construct a cumulative frequency graph? 4. What is a stem-and-leaf plot? 5. How do I construct a dot plot? 6. How do I interpret a pie chart? 7. What is a Pareto chart? 8. How do I construct a scatter plot? 9. What is the line of best fit? 10. What is a time series chart?	Students will be able to: • Construct and interpret frequency histograms and cumulative frequency graphs • Construct and interpret stem-and-leaf plots • Construct and interpret dot plots • Construct and interpret pie charts • Construct and interpret Pareto charts • Construct and interpret scatter plots, finding the line of best fit • Construct and interpret time series charts • Determine the pros and cons of each graph

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Bar graph, Dot plot, Pie Chart	Frequency Distribution, Histogram, Pareto Chart, Cumulative Frequency Graphs

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-ID.A.1	1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. S-ID.B.6	2. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. **Climate Change Example:** Students may represent geoscience data on two quantitative variables on a scatter plot and describe how the variables are related in order to analyze the data and the results from global climate models.
3. S-ID.B.6c	3. Fit a linear function for a scatter plot that suggests a linear association.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
2. SL.II.11–12.2	2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

3. SL.PI.11–12.4	3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-PS2-1	5. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.IML.3	2. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.2	1. Describe the trade-offs in how and where data is organized and stored.
2. 8.1.12.DA.4	2. Explain the relationship between binary numbers and the storage and use of data in a computing device.
3. 8.1.12.DA.5	3. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
4. 8.1.12.DA.6	4. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
5. 8.1.12.AP.2	5. Create generalized computational solutions using collections instead of repeatedly using simple variables.

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Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

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- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

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- Use Prior Results
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- Use a Table
- Use a Graph
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- Recognize Usefulness of Tools
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- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components

- Look for Patterns
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Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Elementary Statistics – Picturing the World - Ron Larson and Betsy Farber

Resources: A variety of technology tools per teacher discretion.

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics

- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 2.1 Frequency Distributions and Their Graphs	
Specific Learning Objective	**Practice & Apply Exercises**
• Construct and interpret frequency distributions • Construct and interpret histograms and cumulative frequency graphs	Ch 2.1 Day 1: 1-22 Day 2: 23 – 33 odds Day 3: 35 – 39 odds, 46, 47

Section Number & Title: 2.2 More Graphs and Displays	
Specific Learning Objective	**Practice & Apply Exercises**
• Construct and interpret stem-and-leaf plots • Construct and interpret dot plots • Construct and interpret pie charts • Construct and interpret Pareto charts • Construct and interpret scatter plots, finding the line of best fit • Construct and interpret time series charts • Determine the pros and cons of each graph	Ch 2.2 Day 1: 1 - 12, 31, 32 Day 2: 13 - 22, 34 Day 3: 23 - 30, 33 Day 4: 35 - 40

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to	The effectiveness of the instructional program	The following assessments require students to

evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources

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Course Name: Probability & Statistics
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PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Ch 2.3-2.5 DESCRIPTIVE STATISTICS USING NUMBERS

In this unit, students will focus on statistical measures that summarize and describe data sets. They will learn about the measures of central tendency, including the mean, median, and mode, and will analyze the shape of data distributions. The unit will also cover measures of variability, such as range, variance, and standard deviation, with an emphasis on understanding the empirical rule in relation to bell-shaped (normal) distributions. Additionally, students will explore the five-number summary, learning how to calculate and interpret quartiles, interquartile range, and create box-and-whisker plots. Finally, students will develop an understanding of the standard score (z-score) and its use in comparing data points within a distribution. By the end of the unit, students will be equipped to analyze data sets using both central tendency and variability measures.

Essential Questions	Learning Targets/Objectives
1. What are the measures of central tendency? 2. What is the shape of the data distribution? 3. What is an outlier? 4. What is the range of the data? 5. What is variance? 6. What is standard deviation? 7. How do I find the five-number summary? 8. How do I construct a box-and-whisker plot? 9. What is the z-score?	Students will be able to: • Find and analyze data using measures of central tendencies (mean, median, mode) • Compare mean and median to determine which measure is best for the given situation • Find and analyze the variation and standard deviation for similar data • Find and analyze the range, quartiles, and interquartile range • Determine if the data is skewed left, right, or is symmetric • Construct five-number summaries and box-and-whisker plots for similar data as above

	• Find the z-score for similar data as above.
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Mean, mode, range	Standard deviation, Variance, Quartiles, Interquartile range, Z-score, Box plot

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-ID.A.2 2. S-ID.A.3 3. S-ID.A.4	1. 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. 2. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). 3. 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.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own

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4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-PS2-2	5. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.IML.3	2. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
3. 9.4.12.IML.4	3. Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.2	1. Describe the trade-offs in how and where data is organized and stored.
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- Use Counterexamples

- Justify Conclusions
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Resources

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- IXL
- Quizizz

- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
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- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 2.3 Measure of Central Tendency	
Specific Learning Objective	**Practice & Apply Exercises**
• Find and analyze data using measures of central tendencies (mean, median, mode)	Ch 2.3 Day 1: 1 – 12, 17 – 33 odd

• Compare mean and median to determine which measure is best for the given situation	Day 2: 35 – 51 odd Day 3: 53 – 59 odd, 61

Section Number & Title: 2.4 Measures of Variation	
Specific Learning Objective	**Practice & Apply Exercises**
• Find and analyze the variation and standard deviation for similar data • Find and analyze the range, quartiles, and interquartile range	Ch 2.4 Day 1: 1 - 20 Day 2: 21 – 24, 25 – 31 odd Day 3: 33 – 40, 41 – 47 odd

Section Number & Title: 2.5 Measures of Position	
Specific Learning Objective	**Practice & Apply Exercises**
• Determine if the data is skewed left, right, or is symmetric • Construct five-number summaries and box-and-whisker plots for similar data as above • Find the z-score for similar data as above.	Ch 2.5 Day 1: 1 - 20 Day 2: 21 – 27 odd Day 3: 39 – 50

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments

Summative	Formative	Performance
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: CORRELATION AND REGRESSION	
Section 9.1 *Students will learn the definition of correlation. Students will learn how to describe the relationship between two variables when data are presented as ordered pairs. Students will learn the definition of the correlation coefficient and learn how to calculate the coefficient by hand and using technology. Students will learn how to interpret the correlation coefficient in the context of a modeling scenario. Students will learn the difference between correlation and causation. Students will learn what questions to consider when evaluating the correlation and causation relationship.* *Section 9.2* *Students will learn how to find the regression equation for a set of ordered pairs by hand and using technology. Students will learn the definition of a residual and learn how to calculate a residual. Students will learn how to use the regression equation to predict a y-value given an x-value. Students will learn how to interpret those prediction values in the context of the problem.*	
Essential Questions	**Learning Targets/Objectives**
1. What is correlation? 2. What are independent and dependent variables? 3. What are the types of correlation? 4. How do you calculate the correlation coefficient? 5. How do you distinguish between correlation and causation? 6. How do you find the equation of a regression line? 7. How do you predict y-values using a regression equation?	Students will be able to: • Determine if there is a correlation between ordered pairs • Identify the type of correlation • Calculate the correlation coefficient by hand and using calculator • Interpret the correlation coefficient for type and strength of linear correlation • Evaluate whether correlation means causation

	• Calculate the slope and y-intercept for a regression line by hand and using a calculator • Write the regression line equation • Interpret the slope of the regression line and its connection to the correlation • Calculate a residual • Predict a y-value using a regression equation and a given x-value
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Scatterplot, Line of Best Fit, Slope, Y-intercept	Correlation, Causation, Regression Line, Correlation Coefficient, Residual

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-ID.B.6a	1. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. Climate Change Example: Students may use linear or exponential functions fitted to geoscience data to solve problems and analyze the results from global climate models to make an evidence-based forecast of the current rate of global climate change.
2. S-ID.B.6c	2. Fit a linear function for a scatter plot that suggests a linear association.
3. S-ID.C.7	3. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
4. S-ID.C.8	4. Compute (using technology) and interpret the correlation coefficient of a linear fit.

5. S-ID.C.9	5. Distinguish between correlation and causation.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
2. SL.II.11–12.2	2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
3. SL.PI.11–12.4	3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.CT.3	2. Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
3. 9.4.12.IML.2	3. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
4. 9.4.12.IML.3	4. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
2. 8.1.12.DA.4	2. Explain the relationship between binary numbers and the storage and use of data in a computing device.
3. 8.1.12.DA.5	3. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

4. 8.1.12.DA.6	4. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Elementary Statistics – Picturing the World - Ron Larson and Betsy Farber

Resources: A variety of technology tools per teacher discretion.

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

9.1 Correlation	
Specific Learning Objective	**Practice & Apply Exercises**
• Determine if there is a correlation between ordered pairs • Identify the type of correlation • Calculate the correlation coefficient by hand and using calculator • Interpret the correlation coefficient for type and strength of linear correlation • Evaluate whether correlation means causation	Day 1: 1-20, Day 2: 21-30 odd

9.2 Linear Regression	
Specific Learning Objective	**Practice & Apply Exercises**
• Calculate the slope and y-intercept for a regression line by hand and using a calculator • Write the regression line equation • Interpret the slope of the regression line and its connection to the correlation • Calculate a residual • Predict a y-value using a regression equation and a	Day 1: 1-16 Day 2: 17-20 Chapter Review: 9.1 (1-4), 9.2 (9-12)

given x-value	

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork

	• Independent practice	

List of Accommodations and Modifications

- Special Education
- 504 Students
- At Risk Students
- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Ch 3 PROBABILITY	
In this unit, students will explore foundational concepts of probability and counting. They will learn how to determine sample spaces and calculate probabilities in various scenarios. The unit will introduce students to conditional probability and the multiplication rule, allowing them to understand how probability is affected in independent and dependent events. Students will also learn the addition rule and how probabilities change when events are mutually exclusive. The unit will conclude with an introduction to counting techniques, specifically focusing on permutations and combinations, enabling students to solve complex probability problems involving ordered and unordered selections. By the end of the unit, students will have a strong grasp of probability theory and its practical applications.	
Essential Questions	**Learning Targets/Objectives**
1. What is the probability of a simple event? 2. What is a sample space? 3. How do I make a tree diagram? 4. What is the fundamental counting principle? 5. What is the law of large numbers? 6. What is the range of probabilities rule? 7. What is the complement of an event? 8. What is conditional probability? 9. What is the difference between independent and dependent events? 10. What does a mutually exclusive event mean?	Students will be able to: ● Create sample spaces for probability experiments ● Use the counting principle to find the total different 5 card hands can be dealt, or how many passwords can be created given parameters ● Use conditional probability involving cards, coins, and a chart full of data ● Use the multiplication rule for “and” events ● Use the addition principle for “or” events with dice, cards, and a chart of data

11. What is the difference between permutations and combinations?	
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Percentages, Probability	Sample Space, Addition Rule, Multiplication Rule, Independent Event, Dependent Event, Compliment, Mutually Exclusive

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-CP.A.1	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. S-CP.A.2	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. S-CP.A.3	3. Understand the conditional probability of *A* given *B* as *P*(*A* 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*.
4. S-CP.A.4	4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
5. S-CP.A.5	5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
6. S-CP.B.6	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. S-CP.B.7 8. S-CP.B.8	7. Apply the Addition Rule, (A or B) = (A) + (B) – (A and B), and interpret the answer in terms of the model. 8. Apply the general Multiplication Rule in a uniform probability model, (A and B) = (A)(B|A) = $P(B)P(A\|B)$, and interpret the answer in terms of the model.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1 2. SL.II.11–12.2 3. SL.PI.11–12.4 4. SL.UM.11–12.5 5. HS-ESS1-4	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. 4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 5. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1 2. 9.4.12.IML.2 3. 9.4.12.IML.3	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas. 2. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources. 3. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1 2. 8.1.12.DA.4	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. 2. Explain the relationship between binary numbers and the storage and use of data in a computing device.

3. 8.1.12.DA.6	3. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:
Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to: ● Explain the Meaning ● Find Entry Points ● Analyze Givens ● Interpret a Solution ● Make a Plan ● Consider Similar Problems ● Check Progress ● Consider Simpler Forms ● Problem Solve **Reason abstractly and quantitatively**: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to: ● Make Sense of Quantities ● Use Equations ● Use Expressions ● Understand Quantities ● Use Operations ● Contextualize ● Relationships ● Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

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- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

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- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

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- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

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- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

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- Find General Methods
- Maintain Oversight
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Resources

Textbook

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- Pear Assessment
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- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
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Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 3.1 Basic Concepts of Probability and Counting	
Specific Learning Objective	**Practice & Apply Exercises**
• Create sample spaces for probability experiments • Use the counting principle to find the total	Ch 3.1 Day 1: 1 – 28 Day 2: 29 - 52

different 5 card hands can be dealt, or how many passwords can be created given parameters	Day 3: 53 – 75 odd

Section Number & Title: 3.2 Conditional Probability and the Multiplication Rule	
Specific Learning Objective	**Practice & Apply Exercises**
• Use conditional probability involving cards, coins, and a chart full of data • Use the multiplication rule for “and” events	Ch 3.2 Day 1: 1- 19 Day 2: 21 – 33 odd

Section Number & Title: 3.3 The Addition Rule	
Specific Learning Objective	**Practice & Apply Exercises**
• Use the addition principle for “or” events with dice, cards, and a chart of data	Ch 3.3 Day 1: 1 - 18 Day 2: 19 - 27

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not	The following assessments require students to utilize various strands of mathematics.

Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources

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Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Discrete Probability Distributions	
Section 4.1 *Students will learn how to distinguish between discrete random variables and continuous random variables. Students will learn how to construct and graph a discrete probability distribution. Students will learn how to determine whether a distribution is a probability distribution. Students will learn how to find the mean, variance and standard deviation of a discrete probability distribution. Students will learn how to find the expected value of a discrete probability distribution.* *Section 4.2* *Students will learn how to determine whether a probability experiment is a binomial experiment. Students will learn how to find binomial probabilities using the binomial probability formula and technology. Students will learn how to construct and graph a binomial distribution. Students will learn how to find the mean, variance and standard deviation of a binomial probability distribution.*	
Essential Questions	**Learning Targets/Objectives**
1. How do you distinguish between discrete random variables and continuous random variables? 2. How do you construct and graph a discrete probability distribution? 3. How do you determine whether a distribution is a probability distribution? 4. How do you find the mean, variance and standard deviation of a discrete probability distribution?	Students will be able to: • Identify discrete and continuous random variables • Construct and graph a discrete probability distribution • Determine a missing probability from a discrete probability distribution • Identify a probability distribution • Find the mean, variance and standard deviation of a discrete probability distribution

5. How do you find the expected value of a discrete probability distribution? 6. How do you determine whether a probability experiment is a binomial experiment? 7. How do you find binomial probabilities using the binomial formula? 8. How do you find binomial probabilities using technology? 9. How do you construct and graph a binomial distribution? 10. How do you find the mean, variance and standard deviation of a binomial probability distribution?	• Find expected value • Identify and understand binomial experiments • Find binomial probabilities using the binomial formula • Find binomial probabilities using technology • Construct and graph binomial distributions • Find and interpret mean, variance and standard deviation of a binomial probability distribution
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Probability, mean, standard deviation, variance	Discrete and continuous random variable, probability distribution, expected value, binomial random variable, binomial distribution

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-MD.A.2	1. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
2. S-MD.A.3	2. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
3. S-MD.A.4	3. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

4. S-MD.B.5a	4. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast food restaurant.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
2. SL.II.11–12.2	2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
3. SL.PI.11–12.4	3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-LS4-3	5. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI. 1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.IML.2	2. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
3. 9.4.12.IML.3	3. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
4. 9.4.12.TL.1	4. Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task.
5. 9.4.12.TL.2	5. Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

2. 8.1.12.DA.4 3. 8.1.12.DA.5 4. 8.1.12.DA.6	2. Explain the relationship between binary numbers and the storage and use of data in a computing device. 3. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. 4. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

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- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities

- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics
- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources
- Use Technology to Explore

Attend to precision: Develop a habit of being careful how you talk about concepts, label your work, and write your answers. Throughout the unit students are given problems that require them to:

- Communicate Precisely
- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
- Label Axes
- Calculate Accurately
- Understand Mathematical Terms

Look for and make use of structure: Look closely to see structure within a mathematical statement, or step back for an overview to see how individual parts make one single object. Throughout the unit students are given problems that require them to:

- View as Components
- Look for Patterns
- Look for Structure

Look for and express regularity in repeated reasoning: Notice patterns and make generalizations. Keeping in mind the goal of a problem helps you evaluate reasonableness of answers along the way. Throughout the unit students are given problems that require them to:

- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Elementary Statistics – Picturing the World - Ron Larson and Betsy Farber
Resources: A variety of technology tools per teacher discretion.

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 4.1 Probability Distributions	
Specific Learning Objective	**Practice & Apply Exercises**
• Identify discrete and continuous random variables • Construct and graph a discrete probability distribution • Determine a missing probability from a discrete probability distribution • Identify a probability distribution • Find the mean, variance and standard deviation of a discrete probability distribution • Find expected value	Day 1: 9 – 27 odd Day 2: 29 – 32, 37, 38

Section 4.2 Binomial Distributions

Specific Learning Objective	Practice & Apply Exercises
• Identify and understand binomial experiments • Find binomial probabilities using the binomial formula • Find binomial probabilities using technology • Construct and graph binomial distributions • Find and interpret mean, variance and standard deviation of a binomial probability distribution	Day 1: 11 – 14, 23 – 31 odd Day 2: 15 - 22 Chapter Review: 4.1 (1 – 10), 4.2 (11 – 20)

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. • Diagnostic Pre-Test • Chapter Tests • Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: • Teacher observations • Self-Assessments • Student record-keeping • Quizzes • Warm-ups • Exit Tickets • Participation in class discussions • Independent practice	The following assessments require students to utilize various strands of mathematics. • Projects • Performance Tasks • Homework • Classwork

List of Accommodations and Modifications

- Special Education
- 504 Students
- At Risk Students
- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

<u>WHY</u> ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Probability and Statistics/ 5.1 Introduction to Normal Distributions and Standard Normal Distribution, 5.2 Normal Distribution: Finding Probabilities	
Students will learn how to interpret graphs of normal probability distributions. They will learn how to find the area under the standard normal curve. Students will learn how to find probabilities for normally distributed variables using a table and using technology.	
Essential Questions	**Learning Targets/Objectives**
How do you interpret graphs of normal probability distributions? How do you find areas under the standard normal curve? How do you find probabilities for normally distributed variables using a table and using technology?	Students will be able to: • Interpret a graph with reference to a normally distribution • Estimate the mean and standard deviation given a graph of a normally distributed variable • Find the area under the standard normal curve by hand and using technology • Compute and interpret z-scores • Find the probability using the standard normal distribution when a z-score is given • Find the probability using the standard normal distribution when a z-score must be computed • Find the percent of data above, below or between given values given that the variable is normally distributed..

Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Mean, standard deviation, area, probability	Normal distribution, standard normal distribution, z-score

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-ID.A.4	1. 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.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1 2. SL.II.11–12.2 3. SL.PI.11–12.4	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-LS4-3	5. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.IML.2	2. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.
3. 9.4.12.IML.3	3. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
2. 8.1.12.DA.4	2. Explain the relationship between binary numbers and the storage and use of data in a computing device.
3. 8.1.12.DA.5	3. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
4. 8.1.12.DA.6	4. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
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- Problem Solve

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- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

ML Resources

- Multi-Language Glossary

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 5.1 Introduction to Normal Distributions and the

Standard Normal Distribution	
Specific Learning Objective	**Practice & Apply Exercises**
• Interpret a graph with reference to a normally distribution • Estimate the mean and standard deviation given a graph of a normally distributed variable • Find the area under the standard normal curve by hand and using technology • Compute and interpret z-scores	1--36, 37-45 odd, 47-56

Section Number & Title: 5.2 Normal Distributions - Finding Probabilities	
Specific Learning Objective	**Practice & Apply Exercises**
• Find the probability using the standard normal distribution when a z-score is given • Find the probability using the standard normal distribution when a z-score must be computed • Find the percent of data above, below or between given values given that the variable is normally distributed	1-6, 7, 11, 15, 19

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments

Summative	Formative	Performance
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork

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State Mandates and Resources

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Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Probability and Statistics/5.3 Normal Distribution: Finding Values,5.4 Sampling Distributions and The Central Limit Theorem	
Students will learn how to find a z score given the area under the normal curve. They will learn how to transform a z-score to an x-value. They will learn how to find a specific data value of a normal distribution given the probability. Students will learn how to find sampling distributions and verify their properties. Students will learn how to interpret the Central Limit Theorem. Students will learn how to apply the Central Limit Theorem to find the probability of a sample mean.	
Essential Questions	**Learning Targets/Objectives**
How do you find a z-score given the area under the normal curve? How do you transform a z-score to an x-value? How do you find a specific data value of a normal distribution given the probability? How do you find sampling distributions and verify their properties? How do you interpret the Central Limit Theorem? How do you apply the Central Limit Theorem to find the probability of a sample mean?	Students will be able to: • Using the standard normal table, find z-scores that correspond to a given cumulative area or percentile. • Find the value that corresponds to a given percentile or probability for a normally distributed variable • Verify properties of a sampling distribution. • Find probabilities using the Central Limit Theorem.
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*

Normal distribution, standard normal distribution, z-score, percentile, probability	Central Limit Theorem

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-ID.A.4	1. 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.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
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3. SL.PI.11–12.4	3. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
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2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	

1. 9.4.12.CI.1 2. 9.4.12.IML.2 3. 9.4.12.IML.3 4. 9.4.12.TL.2	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas. 2. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources. 3. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions. 4. Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.1 2. 8.1.12.DA.4 3. 8.1.12.DA.5 4. 8.1.12.DA.6	1. Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. 2. Explain the relationship between binary numbers and the storage and use of data in a computing device. 3. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. 4. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan

- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

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- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

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- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
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Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

- Apply Mathematics

- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
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- Analyze Relationships
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- Evaluate Results

Resources

Textbook

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Resources: A variety of technology tools per teacher discretion.

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Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
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Gifted & Talented Resources

- Leveled Assessments
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PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 5.3 Normal Distributions: Finding Values	
Specific Learning Objective	**Practice & Apply Exercises**
• Using the standard normal table, find z-scores that correspond to a given cumulative area or	1-16, 17-29 odd, 31-37 odd

percentile. • Find the value that corresponds to a given percentile or probability for a normally distributed variable	

Section Number & Title: 5.4 Sampling Distributions and the Central Limit Theorem	
Specific Learning Objective	**Practice & Apply Exercises**
• Verify properties of a sampling distribution. • Find probabilities using the Central Limit Theorem.	19 – 37 odd

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. ● Diagnostic Pre-Test ● Chapter Tests ● Standardized Tests	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: ● Teacher observations ● Self-Assessments ● Student record-keeping ● Quizzes ● Warm-ups ● Exit Tickets ● Participation in class discussions ● Independent practice	The following assessments require students to utilize various strands of mathematics. ● Projects ● Performance Tasks ● Homework ● Classwork
List of Accommodations and Modifications ● Special Education ● 504 Students ● At Risk Students ● MLL ● Gifted and Talented		

State Mandates and Resources

- New Jersey Student Learning Standards
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Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Probability and Statistics/ Confidence Intervals Ch 6	
Students will learn how to make a meaningful estimate for mean, population proportions, variance, and standard deviations by specifying an interval of values. Students will learn how to make statements regarding the confidence of that intervals with regards to the population parameter.	
Essential Questions	**Learning Targets/Objectives**
How do you find a point estimate and a margin of error? How do you construct and interpret confidence intervals for population mean when standard deviation is known? How do you determine the minimum sample size required when estimating a population mean? How do you interpret the t-distribution? How do you use the t-distribution table? How do you construct and interpret a confidence interval for a population mean when standard deviation is unknown? How do you find a point estimate for a population proportion? How do you construct and interpret confidence intervals for a population proportion? How do you determine the minimum sample size required when estimating a population proportion? How do you interpret the chi-square distribution and use the chi-square	Students will be able to: • Find the margin of error for the mean when standard deviation is known • Find the critical value necessary to construct confidence intervals for the mean when standard deviation known • Construct confidence intervals for a population mean with standard deviation known • Interpret confidence intervals for a population mean with standard deviation known • Find the margin of error and the sample mean given a confidence interval • Determine the minimum sample size needed when estimating the mean • Find the margin of error for the mean when standard deviation is unknown

table? How do you construct and interpret confidence intervals for a population variance and standard deviation?	• Find the critical value necessary to construct confidence intervals for the mean when standard deviation unknown • Construct confidence intervals for a population mean with standard deviation unknown • Interpret confidence intervals for a population mean with standard deviation unknown • Find the point estimate for the population proportion • Find the margin of error and the sample proportion given a confidence interval • Construct confidence intervals for a population proportion • Interpret confidence intervals for a population proportion • Find the chi-square critical values for a given confidence level and sample size • Construct confidence intervals for a population variance • Interpret confidence intervals for a population standard deviation
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Mean, standard deviation, proportion, sample size	point estimate, unbiased estimator, interval estimate, level of confidence, critical values, sampling error, margin of error, confidence interval, t-distribution, degrees of freedom, population proportion, chi-square distribution

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-IC.A.1	1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population

2. S-IC.B.4	2. 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.
NJSLS	**Interdisciplinary Connections**
1. SL.PE.11–12.1	1. Initiate and participate effectively in a range of collaborative discussions (one on- one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
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4. SL.UM.11–12.5	4. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
5. HS-ESS1-4	5. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
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- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
- Critique Reasoning
- Use Logic
- Error Analysis

Model with mathematics: Apply the mathematics to a real-life problem, and you interpret mathematical results in the context of the situation. Throughout the unit students are given problems that require them to:

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- Simplify a Solution
- Use a Diagram
- Use a Table
- Use a Graph
- Use a Formula
- Analyze Relationships
- Interpret Results
- Model Real Life

Use appropriate tools strategically: Know what tools are available and think about how each tool might help solve a mathematical problem. Use a tool for its advantages, while being aware of its limitations. Throughout the unit students are given problems that require them to:

- Choose Tools
- Recognize Usefulness of Tools
- Use Other Resources

- Use Technology to Explore

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- Use Clear Definitions
- State the Meaning of Symbols
- Specify Units
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- Calculate Accurately
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- Repeat Calculations
- Find General Methods
- Maintain Oversight
- Evaluate Results

Resources

Textbook

Elementary Statistics – Picturing the World - Ron Larson and Betsy Farber

Resources: A variety of technology tools per teacher discretion.

Online Resources

- Desmos Activities
- Pear Assessment
- IXL
- Quizizz
- EdPuzzle
- Canva
- Khan Academy
- Inside Mathematics
- NJDOE Digital Item Library
- New Jersey Center for Teaching and Learning
- New Jersey Climate Education Hub

Integrated Technology

- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section Number & Title: 6.1 Confidence Intervals for the Mean (σ Known)	
Specific Learning Objective	**Practice & Apply Exercises**
• Find the margin of error for the mean when standard deviation is known • Find the critical value necessary to construct confidence intervals for the mean when standard deviation known • Construct confidence intervals for a population mean with standard deviation known • Interpret confidence intervals for a population mean with standard deviation known • Find the margin of error and the sample mean given a confidence interval • Determine the minimum sample size needed when estimating the mean	1-15 odd, 17-20, 21-33 odd, 35-41 odd, 45, 47, 49, 55

Section Number & Title: Section 6.2 Confidence Intervals for the Mean (σ Unknown)	
Specific Learning Objective	**Practice & Apply Exercises**
• Find the margin of error for the mean when standard deviation is unknown • Find the critical value necessary to construct confidence intervals for the mean when standard deviation unknown • Construct confidence intervals for a population mean with standard deviation unknown • Interpret confidence intervals for a population mean with standard deviation unknown	1-16, 17-29 odd

Section Number & Title: Section 6.3 Confidence Intervals for Population Proportions	
Specific Learning Objective	**Practice & Apply Exercises**
• Find the point estimate for the population proportion • Find the margin of error and the sample proportion given a confidence interval • Construct confidence intervals for a population proportion • Interpret confidence intervals for a population proportion	1-10, 11-19 odd, 21-25 odd

Section Number & Title: Section 6.4 Confidence Intervals for Variance and

Standard Deviation	
Specific Learning Objective	**Practice & Apply Exercises**
• Find the chi-square critical values for a given confidence level and sample size • Construct confidence intervals for a population variance • Interpret confidence intervals for a population standard deviation	1-12, 13-23 odd

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

Assessments		
Summative	**Formative**	**Performance**
The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period. • Diagnostic Pre-Test	The effectiveness of the instructional program will be based on numerous activities and strategies including the following and are not limited to: • Teacher observations • Self-Assessments • Student record-keeping • Quizzes • Warm-ups	The following assessments require students to utilize various strands of mathematics. • Projects • Performance Tasks • Homework • Classwork

• Chapter Tests • Standardized Tests	• Exit Tickets • Participation in class discussions • Independent practice	

List of Accommodations and Modifications

- Special Education
- 504 Students
- At Risk Students
- MLL
- Gifted and Talented

State Mandates and Resources

- New Jersey Student Learning Standards
- Standards for Mathematical Practices

Black Horse Pike Regional School District

Where inspiring excellence is our standard, and student achievement is the result.

Course Name: Probability & Statistics
Course Number: 034800

Updated: June 2024

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Unit Title: Hypothesis Testing with One Sample

Section 7.1
Students will learn how to state a null and an alternative hypothesis. Students will learn how to identify a Type I and a Type II error. Students will learn how to know whether to use a one-tailed or a two-tailed statistical test. Students will learn how to interpret a decision based on the results of a statistical test.
Section 7.2
Students will learn how to find and interpret P-values. Students will learn how to use P-values for a z-test for a mean when the population standard deviation is known. Students will find critical values and rejection regions in the standard normal distribution. Students will learn how to use rejection regions for a z-test for a mean when σ is known.
Section 7.3
Students will learn how to find critical values for a t-distribution. Students will learn how to use the t-test to test a mean when σ is not known. Students will learn how to use technology to find P-values and use them with a t-test to test a mean when σ is not known.
Section 7.4
Students will learn how to use the z-test to test a population proportion.
Section 7.5
Students will learn how to find critical values for a chi-square test. Students will learn how to use the chi-square test to test a variance or a standard deviation.

Essential Questions	Learning Targets/Objectives
1. How do you state a null and alternative hypothesis? 2. How do you identify Type I and Type II errors and interpret the level of significance? 3. How do you know whether to use a one-tailed or a two-tailed test and find a P-value? 4. How do you make and interpret a decision based on the results of a statistical test? 5. How do you write a claim for a hypothesis test? 6. How do you find and interpret P-values? 7. How do you use P-values for a z-test for a mean when σ is known? 8. How do you find critical values and rejection regions in the standard normal distribution? 9. How do you use rejection regions for a z-test for a mean when σ is known? 10. How do you find critical values in a t-distribution? 11. How do you use the t-test to test a mean when σ is unknown? 12. How do you use technology to find P-values and use them with a t-test to test a mean when σ is unknown? 13. How do you use the z-test to test a population proportion? 14. How do you find critical values for a chi-square test? 15. How do you use the chi-square test to test a variance or a standard deviation?	Students will be able to: • State null and alternative hypotheses • Determine whether a test is one-tailed or two-tailed. • Describe Type I and Type II errors. • Interpret a decision in context of the alternative hypothesis. • Find critical values and rejection regions for a z-test for a mean with σ known. • Perform a hypothesis test for a mean when σ is known. • Find critical values for a t-distribution. • Perform a hypothesis test for a mean when σ is unknown. • Perform a hypothesis test for a proportion. • Find critical values for a chi-square test. • Perform a hypothesis test for a variance. • Perform a hypothesis test for a standard deviation.
Tier 2 Vocabulary *High-frequency words used throughout the unit*	**Tier 3 Vocabulary** *Discipline-specific words used throughout the unit*
Critical value, mean, standard deviation, proportion, variance	Null and alternative hypotheses, hypothesis test, one-tailed, two-tailed, Type I and II errors, rejection region, level of significance, standardized test statistic, P-value

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

New Jersey Student Learning Standards That Support Learning Targets	
2023 New Jersey Student Learning Standards for Mathematics	
1. S-IC.A.1	1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
2. S-ID.A.4	2. 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.
3. S-MD.B.7	3. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).
NJSLS	**Interdisciplinary Connections**
1. SL.II.11–12.2	1. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
2. SL.PI.11–12.4	2. Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
3. SL.UM.11–12.5	3. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
4. HS-ESS3-1	4. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
2020 New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
1. 9.4.12.CI.1	1. Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
2. 9.4.12.IML.2	2. Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.

3. 9.4.12.IML.3 4. 9.4.12.TL.2	3. Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions. 4. Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
2020 New Jersey Student Learning Standards for Computer Science and Design Thinking	
1. 8.1.12.DA.4 2. 8.1.12.DA.5 3. 8.1.12.DA.6	1. Explain the relationship between binary numbers and the storage and use of data in a computing device. 2. Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. 3. Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

The 8 Mathematical Practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments, and projects:

Make sense of problems and persevere in solving them: Take time to analyze the given information and what the problem is asking to help you to plan a solution pathway. Throughout the unit students are given problems that require them to:

- Explain the Meaning
- Find Entry Points
- Analyze Givens
- Interpret a Solution
- Make a Plan
- Consider Similar Problems
- Check Progress
- Consider Simpler Forms
- Problem Solve

Reason abstractly and quantitatively: Investigate specific examples and represent them symbolically, and observe the relationships in numbers or symbols to derive conclusions about a concrete instance. Throughout the unit students are given problems that require them to:

- Make Sense of Quantities
- Use Equations
- Use Expressions
- Understand Quantities
- Use Operations
- Contextualize
- Relationships
- Reason Abstractly

Construct viable arguments and critique the reasoning of others: Make and justify conclusions and decide whether others' arguments are correct or flawed. Throughout the unit students are given problems that require them to:

- Use Assumptions
- Use Defi nitions
- Use Prior Results
- Make Conjectures
- Build Arguments
- Analyze Conjectures
- Use Counterexamples
- Justify Conclusions
- Compare Arguments
- Construct Arguments
- Listen and Ask Questions
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- Use Logic
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- Google Suite: Google Classroom, Docs, Drive, Mail, etc...
- Devices:
  - Chromebooks
  - Texas Instrument TI-84 Plus Graphing Calculator

Gifted & Talented Resources

- Leveled Assessments
- Enrichment worksheets

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills?

Section 7.1 Introduction to Hypothesis Testing	
Specific Learning Objective	**Practice & Apply Exercises**
• State null and alternative hypotheses • Determine whether a test is one-tailed or two-tailed. • Describe Type I and Type II errors. • Interpret a decision in context of the alternative hypothesis.	Day 1: 11, 13,15, 21 – 47 odd

Section 7.2 Hypothesis Testing for the Mean (σ Known)	
Specific Learning Objective	**Practice & Apply Exercises**
• Find critical values and rejection regions for a z-test for a mean with σ known. • Perform a hypothesis test for a mean when σ is known. • Find critical values for a t-distribution.	Day 1: 31 – 36 Day 2: 37 – 42

Section 7.3 Hypothesis Testing for the Mean (σ Unknown)	
Specific Learning Objective	**Practice & Apply Exercises**
• Perform a hypothesis tests for a mean when σ is unknown.	Day 1: 15 – 22 Day 2: 23 - 28

Section 7.4 Hypothesis Testing For Proportions	
Specific Learning Objective	**Practice & Apply Exercises**
• Perform a hypothesis test for a proportion. • Find critical values for a chi-square test.	Day 1: 9 – 16 with critical regions Day 2: 9 – 16 with P-values

Section 7.5 Hypothesis Testing for Variance and Standard Deviation	
Specific Learning Objective	**Practice & Apply Exercises**
• Perform a hypothesis test for a variance.	Day 1: 17 – 24 critical regions

• Perform a hypothesis test for a standard deviation.	Day 2: 17 – 27 P-values

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