Unit 4: Statistics and Probability

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **5 weeks**
Status: **Published**

Brief Summary of Unit

Introduction: The "Statistics and Probability" unit is designed to introduce 7th-grade students to fundamental concepts in statistics and probability. Over the course of 16 days, students will explore samples, populations, experimental and theoretical probability, compound events, and simulations. They will use random samples to describe and compare populations and learn about the basics of probability. The unit emphasizes hands-on activities, data analysis, problem-solving strategies, and real-world applications to help students develop a strong understanding of statistical and probability concepts.

Revision Date: 5/31/24

Standards

Analyzing various sets of data will allow students to explore studies about people from different backgrounds. Statistical studies and analysis provides students an opportunity to read about historical statistics about people's cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

New Jersey Diversity and Inclusion Law

In accordance with New Jersey’s Chapter 32 Diversity and Inclusion Law, this unit includes instructional

materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

Commission on Holocaust Education

This unit further reflects the goals of the Holocaut Education mandate where students are able to identify and analyze applicable theories concerning human nature and behavior; understand that genocide is a consequence of prejudice and discrimination; understand that issues of moral dilemma and conscience have a profound impact on life; and understand the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

1	Make sense of problems and persevere in solving them
2	Reason abstractly and quantitatively
3	Construct viable arguments and critique the reasoning of others
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
4	Model with mathematics
9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning
	Historians consider the relevance and validity of sources to understand the perspectives of those involved when evaluating historical arguments.
7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
7.SP.B.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that

	expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
7.SP.C.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
7.SP.C.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
7.SP.C.8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
7.SP.C.8.c	Design and use a simulation to generate frequencies for compound events.
MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. Analyzing data 6–8 builds on grades K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Patterns Cause and Effect

Essential Questions

- How can we use probability to make predictions and decisions in everyday life?
- How can we use samples to make accurate predictions and conclusions about entire populations?
- How do compound events and simulations help us understand and analyze complex probability situations?
- How do variability and randomness affect the accuracy of statistical estimates and conclusions?
- What is the difference between experimental and theoretical probability, and how can we calculate each?
- What methods can we use to compare different populations and identify meaningful differences or similarities?

Enduring Understandings

- Central tendency is a way of describing a data set using one number.
- Combinations are used to choose things from a group when order does not matter. Permutations are used to choose things from a group when order does matter.
- Probability is used in the real world to make plans, predictions, and informed choices.
- Some graphs and statements about graphs can be misleading when analyzing real world data.

- Tables can be useful in organizing information regarding percent of change, as well as in organizing collected data.
- The value and usefulness of data depends on how it was obtained.
- With independent events, the occurrence of one event does not affect the probability of the other. With dependent events, one event does affect the probability of another.

Students Will Know

- How to use random samples to estimate population parameters, such as mean and proportion.
- Methods for analyzing compound events and calculating probabilities using tree diagrams and organized lists.
- Methods for selecting random samples and their importance in obtaining representative data.
- Techniques for comparing populations based on sample statistics, such as mean, proportion, or median.
- The concept of hypothesis testing and its role in comparing populations and drawing conclusions.
- The concept of simulations and their role in modeling real-world or hypothetical probability situations.
- The concept of variability and its impact on the accuracy of estimates from random samples.
- The concepts of samples and populations and their significance in statistical analysis.
- The definition and significance of probability in predicting outcomes and making decisions.
- The difference between experimental and theoretical probability and how to calculate each.
- The terminology associated with probability, including outcomes, events, sample spaces, and compound events.

Students Will Be Skilled At

- Analyzing compound events and calculating probabilities using tree diagrams and organized lists.
- Applying probability concepts to real-world situations to make predictions and informed decisions.
- Applying statistical techniques to real-world scenarios to make predictions and informed decisions.
- Calculating estimates and measures of variability from random samples.
- Calculating experimental probability based on results from experiments and simulations.
- Calculating theoretical probability using mathematical principles and sample spaces.
- Comparing populations based on sample statistics and interpreting the results.
- Conducting hypothesis tests and drawing conclusions based on random samples.
- Conducting simulations to model and analyze probability scenarios.
- Selecting random samples and collecting data from populations.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, iReady MyPath, Big Ideas Math online

platform problems, and NJSLA test bank problems

- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Big Ideas Math unit assessments
- Benchmark: iReady diagnostic assessments and district placement assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and adaptive learning tasks in iReady, Khan Academy, and Big Ideas Math

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Complete Grade 7 Unit 4 Model Curriculum Assessment
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

Week 1: Introduction to Probability and Experimental Probability

Day 1-2: Introduction to Probability

- Understanding Probability: Define probability and its significance in everyday life.
- Probability Terminology: Introduce terms such as outcomes, events, and sample spaces.
- Guided Practice: Hands-on activities and examples to explore basic probability concepts.
- Real-World Applications: Apply probability concepts to scenarios like weather predictions or sports outcomes.

Day 3-4: Experimental and Theoretical Probability

- Experimental Probability: Define experimental probability and understand how to calculate it using outcomes from experiments.
- Theoretical Probability: Define theoretical probability and understand how to calculate it using sample

spaces and mathematical principles.

- Guided Practice: Conduct experiments and simulations to calculate experimental probabilities and compare them to theoretical probabilities.
- Real-World Applications: Apply experimental and theoretical probability to scenarios like games of chance or medical trials.

Week 2: Compound Events and Simulations

Day 5-6: Compound Events

- Understanding Compound Events: Define compound events and understand their relationship to the intersection and union of events.
- Calculating Compound Probabilities: Use tree diagrams and organized lists to calculate probabilities of compound events.
- Guided Practice: Step-by-step exercises on calculating probabilities of compound events.
- Real-World Applications: Apply compound probability concepts to scenarios like drawing cards from a deck or selecting items from a bag.

Day 7-8: Simulations

- Introduction to Simulations: Define simulations and understand their role in modeling real-world or hypothetical situations.
- Conducting Simulations: Use random sampling methods or technology to conduct simulations.
- Analyzing Simulations: Interpret results from simulations and draw conclusions based on probability outcomes.
- Real-World Applications: Apply simulation techniques to scenarios like predicting election outcomes or analyzing stock market trends.

Note: NJSLA includes mean absolute deviation, range, and/or interquartile range

Week 3: Samples, Populations, and Descriptive Statistics

Day 9-10: Samples and Populations

- Introduction to Statistics: Define statistics and introduce the concepts of samples and populations.
- Understanding Populations: Identify characteristics of populations and methods for selecting random samples.
- Guided Practice: Hands-on activities to explore samples and populations.
- Real-World Applications: Apply sampling techniques to scenarios like opinion polls or market research.

Day 11-12: Using Random Samples to Describe Populations

- Estimating Population Parameters: Learn how to use random samples to estimate population parameters, such as mean and proportion.
- Measuring Variability: Understand the concept of variability and its impact on the accuracy of estimates from random samples.
- Guided Practice: Calculating estimates and measures of variability from random samples.
- Real-World Applications: Apply descriptive statistics to scenarios like estimating the average height of students in a school or the proportion of voters supporting a candidate.

Week 4: Comparing Populations Using Random Samples

Day 13-14: Comparing Populations

- Comparing Sample Statistics: Learn how to compare populations based on sample statistics, such as mean, proportion, or median.
- Interpreting Differences: Understand how to interpret and communicate differences between populations using statistical measures.
- Guided Practice: Comparing populations using sample statistics and interpreting results.
- Real-World Applications: Apply comparative statistics to scenarios like comparing test scores between different schools or analyzing demographic differences between regions.

Day 15-16: Using Random Samples to Compare Populations

- Comparing Populations with Random Samples: Learn how to use random samples to compare populations and make inferences about population parameters.
- Hypothesis Testing: Introduce the concept of hypothesis testing and its role in comparing populations.
- Guided Practice: Conducting hypothesis tests and drawing conclusions based on random samples.
- Real-World Applications: Apply hypothesis testing to scenarios like comparing the effectiveness of two treatments or evaluating the impact of a policy change.

Materials

Core instructional materials: Core Book List including Big Ideas Math textbook and online platform for all levels of grade 6, 7, 8, and Algebra 1

Supplemental materials: Khan Academy, Edia, Delta Math, & iReady.

Additional Materials: Dice, coins, spinners, and other randomizers for experiments and simulations. (some use of calculators - for statistics)

- Calculators/Math Tools
- District approved textbook
- Manipulatives
- Teacher created activiites
- Teacher created notes
- Websites, such as Khan Academy

Suggested Strategies for Modifications

Possible accommodations/modifications for Grade 7