Unit 8: Statistics and Variability

Content Area: **Mathematics**
Course(s):
Time Period: **Trimester 3**
Length: **20 Days**
Status: **Published**

Summary

In the Data and Statistics unit, students will learn to understand and summarize data sets by calculating measures of central tendency, such as mean, median, and mode. They will interpret and create various types of graphs, including histograms and box plots, to visually represent data distributions. Students will also explore concepts of variability and the spread of data, using range and interquartile range to compare data sets. Through real-world applications and problem-solving activities, students will develop critical thinking skills and a deeper understanding of how to analyze and present data effectively.

Revision Date: June 2024

Standards

When analyzing data sets from various population sets, the following are being addressed:

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.

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.

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.

MATH.K-12.1 Make sense of problems and persevere in solving them

MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
ELA.L.VL.6.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, including technical meanings, choosing flexibly from a range of strategies.
MATH.K-12.8	Look for and express regularity in repeated reasoning
ELA.L.VI.6.4	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
ELA.SL	Speaking and Listening
MATH.6.SP	Statistics and Probability
MATH.6.SP.A	Develop understanding of statistical variability
MATH.6.SP.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
MATH.6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
MATH.6.SP.A.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
MATH.6.SP.B	Summarize and describe distributions
MATH.6.SP.B.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
MATH.6.SP.B.5	Summarize numerical data sets in relation to their context, such as by:
MATH.6.SP.B.5.a	Reporting the number of observations.
MATH.6.SP.B.5.b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
MATH.6.SP.B.5.c	Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
MATH.6.SP.B.5.d	Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.K-12.P.9	Work productively in teams while using cultural/global competence.
	Patterns
	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.

Essential Questions

- How can different types of graphs and charts help us interpret and compare data?
- How can we collect, organize, and display data to understand and communicate information effectively?
- How can we use data analysis to make informed decisions in real-world situations?
- What do measures of central tendency (mean, median, and mode) tell us about a data set?
- Why is it important to understand variability and spread within a data set, and how do we measure it?

Enduring Understandings

- Critical Thinking: Analyzing data requires critical thinking to evaluate information, recognize patterns, draw conclusions, and address outliers or inconsistencies.
- Data Collection and Organization: Understanding how to systematically collect and organize data is essential for accurate analysis and meaningful interpretation.
- Ethical Data Use: Ensuring data accuracy, reliability, and ethical use is fundamental in conducting and interpreting statistical investigations.
- Graphical Representations: Different types of graphs and charts, such as histograms, box plots, and bar graphs, are crucial for visually communicating data and making comparisons.
- Measures of Central Tendency: Mean, median, and mode are key tools for summarizing data sets and identifying patterns or trends.
- Real-World Applications: Data analysis skills are valuable for making informed decisions in everyday life, as well as in various academic and professional fields.
- Variability and Spread: Recognizing and measuring variability in data sets, through concepts like range and interquartile range, helps in understanding the distribution and reliability of the data.

Students Will Know

- Central Tendency Concepts: Students will know the definitions and purposes of mean, median, and mode.
- Data Collection Methods: Students will know the basic methods for collecting and organizing data accurately.
- Graph Types: Students will know the appropriate use and characteristics of histograms, dot plots, box plots, bar graphs, stem and leaf plots and line plots.
- Real-World Applications: Students will know examples of how data and statistics are used in various fields and everyday decision-making.
- Statistical Vocabulary: Students will know the terms and concepts related to data and statistics, such as outliers, skewness, and distributions.
- Types of Data: Students will know the differences between qualitative and quantitative data.
- Variability Measures: Students will know how to calculate and interpret range, interquartile range, and mean absolute deviation.

Learning Plan

Day 1: Introduction to Statistical Questions

- Recognize and formulate statistical questions.
- Discuss statistical questions vs. non-statistical questions. Provide examples and have students create their own.

Day 2: Data Collection Methods and Introduction of Statistical Vocabulary (peak, cluster, gap etc.)

- Learn about different data collection methods.
- Discuss surveys, experiments, and observational studies. Group project to design a simple survey.

Day 3: Introduction to Dot Plots

- Understand basic plots for data representation
- Overview of dot plots. Practice creating and interpreting dot plots with sample data.. Examples and initial practice.

Day 4-5: Creating Histograms

- Create and interpret histograms.
- Instruction on creating histograms. Practice creating histograms with sample data.

Day 6: Introduction to Measures of Center

- Understand mean, median, and mode.
- Definitions and examples of mean, median, and mode. Practice calculations.

Day 7-8: Calculating Mean, Median and Mode

- Calculate and interpret the mean, median and mode..
- Practice problems and real-world examples. Students determine which measure would best represent the data, including data sets with and without outliers.

Day 9: Review and Quiz on Dot Plots, Histograms and Measures of Center

Day 10: Introduction to Variability

- Students develop an understanding that data can vary slightly or greatly. Define range and calculate range give various data sets or data displays.

Day 11,12: Interpreting and Creating Box and Whisker Plots

- Create and interpret box and whisker plots.
- Instruction on creating box plots. Practice creating box plots with sample data. Practice interpreting Box Plots, including range, interquartile range and quartiles.

Day 13: Quiz on Variability and Box Plots

Day 14-15: Interpreting and Calculating Mean Absolute Deviation

- Calculate and interpret MAD.
- Step-by-step calculation of MAD. Practice problems.

Day 16: Variability in Context

- Apply measures of variability to real-world scenarios.
- Group activities with real-world data sets. Discussion and presentation of findings.

Day 16 Quiz on Interpreting and Calculating MAD, Variability

Day 17: Interpreting Data Distributions

- Interpret data distributions in context.
- Analyze different data distributions. Discuss patterns and deviations.

Day 18: Choosing Appropriate Data Displays

- Choose the best data display for a given data set.
- Practice choosing and justifying the best display method for different data sets.

Day 19: Review and Practice

- Review all concepts and practice skills.
- Comprehensive review session with practice problems and group activities.

Day 20: Unit Assessment

- Assess understanding of data and statistics concepts.
- Unit test covering all topics from the unit. Post-test discussion and feedback.

Total number of days - 20

- Analyze all types of graphs and answer questions relating to these graphs. Apply problem solving skills of interpreting graphs to a story problem.
- Analyze misleading graphs. Emphasize the importance of analyzing scales and intervals.
- Collect data and use the data to find the measures of center and variability, including mean, median, mode, range, interquartile range and determine which measure best describes the data.
- Define terms that describe a set of data (peaks, clusters, gaps) and the measures of central tendency (mean, median, mode) and range. Define outlier and explain how it affects the measures of central tendency.
- Define variability (interquartile range and/or mean absolute deviation). Describe any overall pattern and any striking deviations from the overall pattern with references to the context in which the data was gathered.
- Introduce statistics and statistical questions as ones that anticipates variability in data.
- Teach students how to make a tally table, frequency table with intervals, a histogram, box-and-whisker, dot plots, box plots, line plot. Discuss how histograms are different from bar graphs.
- Use line plots, frequency tables, bar graphs and box and whisker plots to find measures of central tendency and describe the data.

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

Materials

Core: Core Book List including Big Ideas Math Modeling Real Life, Big Ideas Student Journal Workbook

Supplemental: Khan Academy, iReady, IXL (for intervention)

Suggested Strategies for Modifications

Possible accommodations/modifications for Grade 6