Unit 09: Statistics

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 25**
Length: **4 weeks**
Status: **Published**

Unit Overview

In this unit, students will move from simply representing data into analysis of data. Students will begin by recognizing a statistical question as one that can be answered by collecting data. They will learn that the data collected to answer a statistical question has a distribution that is often summarized in terms of center, variability, and shape. Throughout the unit, students will see and represent data distributions using dot plots, histograms, and box-and-whisker plots. They will study quantitative ways to summarize numerical data sets in relation to their context and to the shape of the distribution. Finally, students will demonstrate how to conduct a survey by constructing a statistical question, surveying their peers, and representing what they have learned with graphical, verbal, and numerical summaries.

Standards

MA.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.
MA.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.
MA.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.
MA.6.SP.B.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
MA.6.SP.B.5	Summarize numerical data sets in relation to their context, such as by:
MA.6.SP.B.5a	Reporting the number of observations.
MA.6.SP.B.5b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
MA.6.SP.B.5c	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.
MA.6.SP.B.5d	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.

Essential Questions

- How can the wording of a statistical question influence the results of a survey?
- How do you know which type of graph to use when displaying data?
- Why is it important to know the measures of center of a set of data when finding the measures of

variability?

Application of Knowledge: Students will know that...

- a dot plot is a data display in which each data point is represented as a dot over its corresponding value on a number line.
- a histogram is a data data in which data is represented by vertical lines above intervals on a number line.
- a measure of center is a number that represents the middle of a data set (the median or mean).
- a measure of variability is a number that describes the variability of a data set (the range, interquartile range, or mean absolute deviation).
- a statistical question is a question that can be answered by collecting data and where there will be variability in the data.
- box-and-whisker plots are useful for interpreting the distribution of data.
- box-and-whisker plots divide the data into four sections in which each section represents 25% of the data.
- data are numbers or other pieces of information collected by asking questions, measuring, or making observations about the real world.
- data values that are spread out have high variability and data values that are close together have low variability.
- dot plots are useful for seeing clusters and gaps in a data set.
- in box-and-whisker plots, the first and third quartiles are at the ends of the box, the median is indicated with a vertical line in the interior of the box, and the maximum and minimum are at the ends of the whiskers.
- the greater the number for the mean absolute deviation, the higher the variability of the data.
- the interquartile range is the difference between the third and first quartiles.
- the mean absolute deviation describes how much the data values are spread out from the mean of a data set. The mean absolute deviation is the average distance that the data values are spread around the mean.
- the mean is strongly affected by outliers in the data.
- the mean is the average of a data set and is found by finding the sum of the data values and dividing by the amount of values.
- the median is the middle number when the data values are ordered from least to greatest.
- the range is the difference between the maximum and minimum values.
- variability describes how much the data values in a data set differ from each other.

Application of Skills: Students will be able to...

- analyze and answer questions based on data displayed on box-and-whisker plots.
- analyze and answer questions based on data displayed on dot plots.
- analyze and answer questions based on data displayed on histograms.

- calculate the measures of center of a set of data values.
- calculate the measures of variability of a set of data values.
- choose an appropriate data display based on the statistical question and the data that is collected.
- create a survey and present their findings graphically and qualitatively while showing numerical evidence to support their findings.
- create box-and-whisker plots.
- create dot plots.
- create histograms.
- identify and create statistical questions.
- identify whether a data set has low or high variability by analyzing the data displays and the measure of variability.

Assessments

- Do-Nows: These daily assessments will be used to check for prior knowledge and to determine mastery of particular topics. If needed, remediation will be completed on an as needed basis.
- Communicator practice: This will be used as a quick whole-class assessment tool to check for complete comprehension.
- Exit Tickets: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Practice using IXL
- Mean Absolute Deviation "Math Lib": An activity that can be used as a formative assessment (see description in activity section).
- Survey Project: An activity that can be used as a summative assessment (see description in activity section).
- Mid-Unit Quiz
- Unit Test
- End-of-Year Benchmark Assessment: Information from this unit will be included on the end-of-year assessment

Suggested Activities

- Grade 6 Digits Topics 15 and 16 Launches
- Student-centered SMART Board lessons: including drag and drop for organizing data when creating data displays and interactive graph wizard for constructing graphs
- Review games using Communicators
- Box-and-Whisker Plot Birthday Activity: Students will come to the SMART Board and write the date of their birthday. Using the drag and drop feature, the data will be ordered from least to greatest. Then, a box-and-whisker plot will be constructed from the data. Questions regarding this specific box-and-whisker plot
- Box-and-Whisker Plot Practice Activity: Students will be given a worksheet of blank number lines and a worksheet containing numbers to be cut out (or have students use a interactive random number generator using Chrome books). They will flip the number cards upside down and be given a set

number of cards to select. Students can use the cards to organize the numbers. Then, they will construct a box-and-whisker plot from their selected data values. This activity will be repeated with different amounts of number cards to be selected each time.

- Mean Absolute Deviation "Math Lib": Students will work in partners to complete a gallery walk containing problems involving calculating mean absolute deviation. Each problem will be posted around the room. Each problem is multiple choice and also has a word or phrase written next to each answer choice. Once students have completed a problem, they will put the corresponding phrase in the labeled space on a "math lib" (similar to "mad lib"). Once students have completed all of the problems, they will be left with a funny story. This can be used as a formative assessment.
- Survey Project: Students will complete a culminating project that assesses numerous topics from this unit. Students will create a statistical question and then survey their classmates as well as other peers in their grade. Then, they will represent their data using a dot plot, histogram, and box-and-whisker plot. Finally, they will write a response of their findings. This will include which data display that they believe best represents their results, the measures of center (median and median), the measures of variability (range, interquartile range, and mean absolute deviation), and whether the results had high or low variability. Students may display their findings electronically or they may write it by hand. This can be used as a summative assessment.

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
  - Modifications & accommodations as listed in the student's IEP
  - Assign a peer to help keep student on task
  - Modified or reduced assignments
  - Reduce length of assignment for different mode of delivery
  - Increase one-to-one time
  - Working contract between you and student at risk
  - Prioritize tasks
  - Think in concrete terms and provide hands-on-tasks
  - Position student near helping peer or have quick access to teacher
  - Anticipate where needs will be
  - Break tests down in smaller increments

- Content specific modifications may include:
  - Provide personal handout for calculating mean absolute deviation
  - Provide number lines in which the coordinates have a smaller scale and count by one units
  - Provide data sets with fewer data values
  - Provide scaffolded steps for creating box-and-whisker plots and calculating measures of center and variability
  - Provide completed problems for practice work and homework

Differentiation for ELL's:

- General modifications may include:
  - Strategy groups
  - Teacher conferences
  - Graphic organizers

- Modification plan
- Collaboration with ELL Teacher

- Content specific vocabulary important for ELL students to understand include: data, statistical question, variability (or variety), survey, data display, mean, median, mode, range, quartile, dot plot, histogram, box-and-whisker plot, measure of center, measure variability, interquartile range, mean absolute deviation

Differentiation to extend learning for gifted students may include:

- Include data that contains decimals or fractions
- Work with grade-level science teacher to complete an experiment in which data measurements are needed and can be displayed in one of the studied data displays

Integrated/Cross-Disciplinary Instruction

- **ELA:** Practice formulating complete and grammatically correct responses to open-ended questions.
- **Technology:** Students will utilize Chrome books and learn how to create graphs electronically. They may also use technology when surveying their peers and creating their presention of their findings.
- **Science/Social Studies:** Data from science and social studies topics may be used as data values for examples, such as highest elevations of states or daily low temperatures for a specific month).

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: http://exchange.smarttech.com/index.html#tab=0
- SMART Board lessons
- Worksheets of blank number lines
- Worksheets with the numbers 1 - 20 listed on them (numbers can have duplicates)
- Chrome books with Google Apps for Education
- Punchline/Pizzazz worksheets (self-correcting)
- Kuta software generated worksheets

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.

CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.