Unit 7 - Statistics

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 32**
Length: **5 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	Develop understanding of statistical variability.
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 we analyze graphs to make informed decisions?
- How do we choose the most appropriate measure of center to describe a set of data?
- How do you know which type of graph to use when displaying data?
- How does each measure of center describe a set of data?
- How does know about the variation in a set of data influence analysis?
- 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 display in which data is represented by connecting vertical bars above intervals on a number line.
- a measure of center is a number that represents the middle of a data set (mean, median or mode)
- 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 surveying, 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 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 found by dividing the sum of the data values by the amount of values.
- the median is the middle number when the data values are ordered from least to greatest.
- the mode is the number that repeats the most often.
- 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 in dot plots, histograms, and box-and-whisker plots.
- 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 data that is collected.
- choose the appropriate measure of center for a given data set.
- compare and analyze measures of centers and measures of variability
- create a survey and present their findings graphically and qualitatively while showing numerical evidence to support findings.
- create dot plots, histograms, and box-and-whisker plots.
- identify and create statistical questions.

Assessments

- Do Now: These daily assessments will include a few questions to check for prior knowledge and to determine mastery of particular topics. Remediation can also be done through this activity on an as needed basis.
- Exit Tickets and Quick Checks: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic or if there were any common misconceptions amongst the students.
- Communicator Practice: During guided practice, this will be used as a quick whole-class assessment tool to check for complete comprehension.
- IXL Practice: This online tool will be used to formatively assess students during independent practice. This will provide students with practice and immediate self-check.
- Homework and Classwork: These will be used to formatively assess students. Some examples of activities that can be used in class as assessments are listed in suggested activities (Mean Median Mode Range Class Survey, Mean Median Mode Range Task Cards, Data Display Project)
- Marzano learning goals self-assessment: Students will complete tiered questions to determine their own proficiency in the topic on a scale of 0 to 4
- Informal Observations: Walking around the room, listening to productive conversations, and checking in on students will help to formatively assess their learning.
- Mid-Chapter Quiz: This will be used to formatively assess students halfway through the chapter.
- Chapter Test: This will be used to summatively assess students at the end of the chapter.
- Information from this unit will be included on a locally developed, mid-year or end of year benchmark assessment that may take the form of a test, performance based project, or other summative assessment.

Suggested Activities

- Grade 6 Digits Topic 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

- Marzano learning goals self-assessment: Students will complete tiered questions to determine their own proficiency in the topic on a scale of 0 to 4
- Mean Median Mode Range Class Survey: The class will complete a couple of different investigations to collect data on the students in the class. For example, some survey questions that can be instantly answered during class are the number of jumping jacks in 30 seconds or height of students in the class. After collecting data from the class, students will find the mean, median, mode, and range to find the class center and variability.
- Mean Median Mode Range Task Cards: Students will work in groups to complete problem solving questions on measures of centers. The colors of the cards signify the three skill and problem-solving levels included in the questions.
- Data Display 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:
    - Create foldable for mean, median, mode, and range with definitions, step-by-step instructions, and worked out examples
    - Include less numbers in the data set when calculating statistical measures or graphing
    - Provide personal handout for calculating mean absolute deviation
    - Create graphic organizer for data displays (dot plot, histogram, box-and-whisker plot) with definitions, purpose of graph, and examples
    - Provide number lines in which the coordinates have a smaller scale and count by one units
    - Provide scaffolded steps for creating box-and-whisker plots and calculating measures of center and variability
    - Provide completed worked out examples on classwork and homework students can use as a guide

- Provided guided notes

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 rational numbers
- Find missing number in data set given the mean, which will require multi-step equations
- Use measures of center and measures of variability to find outliers
- 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

Technology Integration

- iPads or Chromebooks as appropriate to the activity.
- Online learning components including use of the Digits digital textbook, Buzzmath, KhanAcademy, and other resources.
- Teacher integration of the SMART board to facilitate active student engagement throughout the course of the lesson.
- Software or online programs that teachers may use to create students materials or generate problems such as Kuta software.
- Additional practice provided through the use of IXL

Integrated/Cross-Disciplinary Instruction

- **ELA:** Using grammatically correct sentences, descriptive words, and transitions when analyzing and comparing measures of center, measures of variability, or data displays
- **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).
- **Physical Education:** Integrating sports statistics when finding measures of center, measures of variability. Graphing data gathered from physical activity or sports statistics
- **Economics:** Make informed decisions based on graphs, such as looking at trends in stock market

prices or gas prices.

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: www.exchange.smartteach.com
- SMART Board Lessons
- Pizzazz worksheets (self-correcting)
- Kuta software generated worksheets
- Khanacademy: www.khanacademy.org
- Buzzmath: www.buzzmath.com
- NCTM Illuminations: www.illuminations.nctm.org
- New Jersey Center for Teaching and Learning: www.njctl.org

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.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.