

10: Data Analysis & Statistics

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will learn the process of statistical investigations. They will construct graphs such as line plots, histograms, and box-and-whisker plots to represent distributions of data and analyze them. They will also compare data distributions using what they know about measure of center and variability.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

- Calculate summary statistics (mean, median, mode, range)
- Construct a frequency table and line plot to organize data
- Observe changes in the mean and median when values are added or removed from the data set
- Describe the shape of a distribution
- Organize and represent data using a histogram
- Find the lower quartile, upper quartile, and interquartile range (IQR) of a data set
- Organize and represent data using a box-and-whisker plot
- Use box-and-whisker plots to compare data
- Compute the mean absolute deviation (MAD)
- Compare how data vary in a distribution

Essential Questions:

- What kind of information can we get from different types of graphs?
- How can the mean, median, mode, and range be used to describe the shape of the data?

Enduring Understandings:

- Statistics are numerical data relating to a group of individuals; statistics is also the name for the science of collecting, analyzing and interpreting such data.
- Data provide powerful perspectives on everyday phenomena.
- Our society is data driven and the ability to understand and interpret data allows us to make informed decisions.

CONTENT AREA STANDARDS

6.RP

A. Understand ratio concepts and use ratio reasoning to solve problems

6.NS

A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions

B. Compute fluently with multi-digit numbers & find common factors & multiples

C. Apply and extend previous understandings of numbers to the system of rational numbers

6.EE

A. Apply and extend previous understandings of arithmetic to algebraic expressions

B. Reason about and solve one-variable equations and inequalities

C. Represent and analyze quantitative relationships between dependent and independent variables

6.G

A. Solve real-world and mathematical problems involving area, surface area, and volume

6.SP

A. Develop understanding of statistical variability

B. Summarize and describe distributions

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
MA.K-12.5	Use appropriate tools strategically.
MA.6.RP.A.3a	Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.6.NS.C.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
MA.6.NS.C.7	Understand ordering and absolute value of rational numbers.

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.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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.EG.8: Analyze the impact of currency rates over a period of time and the impact on trade, employment, and income.

LA.K-12.NJSLSA.R10	Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
CS.K-12.3	Recognizing and Defining Computational Problems
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

STUDENT LEARNING TARGETS

Refer to the 'Declarative Knowledge' and 'Procedural Knowledge' sections.

Declarative Knowledge

Students will understand that:

- Content-specific vocabulary: attribute, box-and-whisker plot (box plot), categorical data, cluster, data, distribution, frequency table, gap, histogram, interquartile range (IQR), interval, line plot, lower quartile, maximum value, mean, mean absolute deviation (MAD), median, minimum value, mode, numerical data, ordered-value bar graph, outlier, quartile, range, scale, shape of a distribution, skewed distribution, symmetric distribution, summary statistic, table, upper quartile, variability
- A set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- A statistical question anticipates an answer that varies from one individual to the next and is written to account for the variability in the data.
- Dot plots are suitable for small to moderate size data sets and are useful for highlighting the distribution of the data.
- A histogram shows the distribution of continuous data using intervals on the number line.
- A box plot shows the distribution of values in a data set by dividing the set into quartiles.
- Measure of center and measure of variation allow for data to be analyzed from different reference points.
- A distribution can be described by its center, spread, and shape.
- Mean Absolute Deviation (MAD) describes the variability of the data set by determining the absolute deviation (the distance) of each data piece from the mean and then finding the average of these deviations.

Procedural Knowledge

Students will be able to:

- Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
- Recognize that a measure of center for a numerical data set summarizes all of its values with a single number.
- Recognize that a measure of variation describes how the values of a numerical data set vary with a single number.
- Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- Summarize numerical data sets in relation to their context by reporting the number of observations.
- Summarize numerical data sets in relation to their context by describing the nature of the attribute under investigation.
- Summarize numerical data sets in relation to their context by giving quantitative measures of center.
- Summarize numerical data sets in relation to their context by giving quantitative measures of variability.
- Summarize numerical data sets in relation to their context by relating the choice of measures of center to the shape of the data distribution and the context in which the data were gathered.
- Summarize numerical data sets in relation to their context by relating the choice of measures variability to the shape of the data distribution and the context in which the data were gathered.

EVIDENCE OF LEARNING

Refer to the 'Formative Assessments' and 'Summative Assessments' sections.

Benchmark Assessments

- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment
- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- Observations
- Classwork
- Homework Assignments
- Do Now Questions
- Exit Tickets
- Self Assessment Questions
- Proficiency Scale

Summative Assessments

- Quizzes
- Unit Assessments
- Graded Assignments
- Projects

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Materials

- *CMP3 Data About Us*
- [Savvas Realize](#) (teacher and student resources)

Supplemental Instructional Materials

- Additional Resources linked [HERE](#)
- Math 6 Enriched Data About Us folder linked [HERE](#)
- [Khan Academy](#)
- [Delta Math](#)
- Illustrative Math Performance Tasks:
 - [6.SP.A.1 Identifying Statistical Questions](#)
 - [6.SP.A.1 Statistical Questions](#)
 - [6.SP.A.2, 6.SP.B.5d Electoral College](#)
 - [6.SP.B.4, 6.SP.B.5c Comparing Test Scores](#)
 - [6.SP.B.5c Math Homework Problems](#)
- [IXL - Recommended](#) Skills Practice
 - GG.3 Interpret Line Plots
 - GG.4 Create Line Plots
 - GG.14 Interpret Histograms
 - GG.15 Create Histograms
 - GG.23 Box Plots
 - HH.1 Identify Statistical Questions
 - HH.2 Identify Mean, Median, Mode and Range
 - HH.5 Changes in Mean, Median, Mode and Range
 - HH.6 Calculate Mean Absolute Deviation
 - HH.7 Calculate Quartiles and Interquartile Range
 - HH.10 Describe Distributions in Line Plots

INTERDISCIPLINARY CONNECTIONS

- Computations
- Financial/Economic/Business/Entrepreneurial Literacy

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.