Standard #: MAFS.912.S-ID.1.1

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Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Grade: 912

Cluster: Summarize, represent, and interpret data on a single count or measurement variable. (Algebra 1 - Additional Cluster) (Algebra 2 - Additional Cluster) -
Clusters should not be sorted from Major to Supporting and then taught in that order. To do so would strip the coherence of the mathematical ideas and miss the opportunity to enhance the major work of the grade with the supporting clusters.

Date Adopted or Revised: 02/14

Content Complexity Rating: Level 2: Basic Application of Skills & Concepts - More Information

Date of Last Rating: 02/14

Status: State Board Approved

Assessed: Yes

Remarks/Examples

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

TEST ITEM SPECIFICATIONS

Item Type(s): This benchmark may be assessed using: GRID item(s)

N/A
Assessment Limits :
None

Calculator :
Neutral

Clarification :
Students will represent data using a dot plot, a histogram, or a box plot.
Stimulus Attributes :
Items should use real-world data and be set in a real-world context
Response Attributes :
Items may require the student to apply the basic modeling cycle.

Items may require the student to choose an appropriate level of accuracy.

Items may require the student to choose and interpret the scale in a graph.

Items may require the student to choose and interpret units.

SAMPLE TEST ITEMS (1)

Test Item #: Sample Item 1
Question:
Max collected data on the height of each of his 20 classmates. The box plot shown represents his data.

Click above the number line to complete the dot plot that could also represent these data.

Difficulty: N/A
Type: GRID: Graphic Response Item Display

Related Courses

Course Number	Course Title
1200310:	Algebra 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200320:	Algebra 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200380:	Algebra 1-B (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200400:	Intensive Mathematics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1210300:	Probability & Statistics with Applications Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000350:	Anatomy and Physiology (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000360:	Anatomy and Physiology Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2020910:	Astronomy Solar/Galactic Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000320:	Biology 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000330:	Biology 2 Honors (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
2003340:	Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003350:	Chemistry 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003360:	Chemistry 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2001320:	Earth/Space Science Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2001340:	Environmental Science (Specifically in versions: 2015 and beyond (current))
2000440:	Genetics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002410:	Integrated Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002430:	Integrated Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002440:	Integrated Science 3 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002450:	Integrated Science 3 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002500:	Marine Science 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002510:	Marine Science 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002520:	Marine Science 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002530:	Marine Science 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003400:	Nuclear Radiation (Specifically in versions: 2014 - 2015, 2015 - 2018 (course terminated))
2020710:	Nuclear Radiation Honors (formerly 202071A) (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003320:	Physical Science Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003380:	Physics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003390:	Physics 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003410:	Physics 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002540:	Solar Energy Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912060:	Access Informal Geometry (Specifically in versions: 2014 - 2015 (course terminated))
7912070:	Access Liberal Arts Mathematics (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912080:	Access Algebra 1A (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912090:	Access Algebra 1B (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7920011:	Access Chemistry 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
2000500:	Bioscience 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2000510:	Bioscience 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2002445:	Integrated Science 3 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
2003345:	Chemistry 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003385:	Physics 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2020 (course terminated))
1200315:	Algebra 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200385:	Algebra 1-B for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912100:	Fundamental Algebraic Skills (Specifically in versions: 2013 - 2015, 2015 - 2017 (course terminated))
1207300:	Liberal Arts Mathematics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912065:	Access Geometry (Specifically in versions: 2015 and beyond (current))
2100335:	African-American History (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912075:	Access Algebra 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
2106410:	Humane Letters 1 - History (Specifically in versions: 2019 and beyond (current))

Related Access Points

Access Point

Access Points Number	Access Points Title
MAFS.912.S-ID.1.AP.1a:	Complete a graph given the data, using dot plots, histograms or box plots.

Related Resources

Formative Assessment

Name	Description
A Tomato Garden:	Students are asked to construct a dot plot corresponding to a given set of data.
Flowering Trees:	Students are asked to determine whether each of two given dot plots are consistent with a given histogram.
Trees in the Park:	Students are asked to construct a box plot corresponding to a given set of data.
Winning Seasons:	Students are asked to construct a histogram corresponding to a given set of data.

Lesson Plan

Name	Description
A Walk Down the Lane:	Students will measure a pre-determined distance between 2 points in a hallway, classroom, or courtyard using 2 different measures (strides or rulers and tailor tape measures.) Once data is collected, return to the classroom to compile data and create box plots. Students should make predictions of which measurement will be most accurate, and how they will determine accuracy. From the box plots created, students should discuss and create a summary of the data collected, median and quartiles, and what conclusions they were able to infer from their graphs about their predictions.
Advantages and Disadvantages of Dot Plots, Histograms, and Box Plots:	This lesson is intended to teach students to compare the advantages and disadvantages of dot plots, histograms and box plots. During this lesson, students will review the statistical process and learn the characteristics of a statistical question; whether it be numerical or categorical. Also, students will learn about the different advantages and disadvantages of dot plots, histograms, and box plots. After this lesson, students are expected to apply the information learned in a project that involves real-world issues and making an analysis based on data collected.
Analyzing Box Plots:	This lesson is designed for students to demonstrate their knowledge of box plots. • Students will need to create four box plots from given data. • Students will need to analyze the data displayed on the box plots by comparing similarities and differences. • Students will work with a partner to complete the displays and the follow-up questions.
Baking Soda and Vinegar: A statistical approach to a chemical reaction.:	Students experiment with baking soda and vinegar and use statistics to determine which ratio of ingredients creates the most carbon dioxide. This hands-on activity applies the concepts of plot, center, and spread.
Box and Whisker Plots:	Introduction lesson on how to create and interpret box and whisker plots.
Bubble Gum Bubbles Lab:	This lesson is a Follow Up Activity to the Algebra Institute and allows students to collect data by blowing bubble gum bubbles and perform statistical analysis, including standard deviation. This lesson provides students an applied setting to use their previously acquired statistical skills.
Burgers to Smoothies.:	"You are what you eat." In this lesson students will use box plots and double box plots to analyze nutritional data about popular food choices.
Can You Walk In My Shoes?:	Real-life data helps students gain a better understanding of creating dot-plot and/or two-way tables. Students will collect data at the beginning of the lesson and use that data to create double dot plots and frequency tables, finding and interpreting relative frequencies. The assignment allows students to work collaboratively and cooperatively in groups. They will communicate within groups to compare shoes sizes and ages to acquire their data. From the collection of data they should be able to predict, analyze and organize the data into categories (two-way tables) or place on a number line (dot-plot). As the class assignment concludes, a discussion of the final class display should take place about the purchasing of shoes versus ages and the relationship that either exists or doesn't exist.
CollegeReview.com:	This is a model-eliciting activity where students have been asked by a new website, CollegeReview.com, to come up with a system to rank various colleges based on five categories; tuition cost, social life, athletics, education, city population and starting salary upon graduation.
Comparing Data Using Box Plots:	Students will use box plots to compare two or more sets of data. They will analyze data in context by comparing the box plots of two or more data sets.
Digging the Plots:	Students are asked to construct given data in a data plot to analyze and determine if the data is symmetric, skewed, or uniform with an appropriate explanation. Students will give a visual display of interpreted results.
Exercise Your Brain, Analyze Your Heart Rate:	Students will compile the data gathered from measuring their resting heart rates and heart rates after exercising into box plots. Using these displays, they will analyze the center, shape, and spread of the data.
Exploring Box plots:	This lesson involves real world data situations. Students will take the data and create, explore, and compare the key components of a box plot.
Florida's Manatee Population:	Students will use box plots to identify data on the past and present manatee populations on both coasts of Florida during the winter months, January through March. This lesson is designed to use technology to create box plots and analyze data. As an alternate lesson without technology, the manatee data in this lesson can be used to create box plots with graph paper and pencils. Students will use data about the past and current manatee populations in Florida and display and analyze the data using Excel and Geogebra. This lesson is intended to be an enrichment experience and should be used after students have mastered box plots as described in the standard MAFS.912.S-ID.1.1.
Grapevine Fabrication Part 1:	This lesson is a Follow Up Activity to the Algebra Institute and allows students to collect data to perform basic statistical operations to analyze and make comparisons on variability within a certain brand of raisins. Part 1 may be completed without Part 2. This investigation can elicit discussion about manufacturing and quality control.

Grapevine Fabrication Part 2:	This lesson is a Follow Up Activity to the Algebra Institute and allows students to collect data to perform basic statistical operations to analyze and make comparisons on variability within a certain brand of raisins. Part 1 must be completed prior to starting Part 2. This investigation can elicit discussion about manufacturing and quality control.
Homework or Play?:	Students will be given data and then plot the data using a graphical method of choice (dot plot, bar graph, box plot, etc.) The students will work in groups and then analyze and summarize the data.
Hot Coffee Coming Through:	In this lesson, students will explore data collection using the temperature probe sensor and perform statistical analysis of the data. Students will use a scientific method of inquiry to plan an investigation to determine which coffee mug is the best. This activity is meant to allow students to use a variety of skills they have acquired throughout a statistics unit in a problem based STEM challenge. Due to the multiple skills there are many standards that are covered. There are two options for this lab. The first student handout is for students at an average high school statistics level (Algebra 1) and will allow for standard deviation and graphical analyses of the data. The second option is for advanced students that have been exposed to hypothesis testing of claims (Algebra 2 or AP Stats).
How long did you study?:	Students will be presented with a set of data and guided notes to compare study time for the Algebra EOC for different classes.
How many licks does it take to get to the center?:	This lesson will have students collect data through an investigative manner and compile them into a larger spreadsheet. From there students will create different data displays and do a compare and contrast of the data sets to determine "Which one do you think takes the fewest amount of licks to get to the center: a Tootsie Pop, a Blow Pop, or a Dum Dum lollipop?"
Interpreting Box Plots:	Students will analyze various real world scenario data sets and create, analyze, and interpret the components of the box plots. Students will use data from morning routines, track times, ages, etc. Lesson includes a PowerPoint, homework, and assessments.
Representing Data 1: Using Frequency Graphs:	This lesson unit is intended to help you assess how well students are able to use frequency graphs to identify a range of measures, make sense of this data in a real-world context, and understand that a large number of data points allow a frequency graph to be approximated by a continuous distribution.
Representing Data 2: Using Box Plots:	This lesson unit is intended to help you assess how well students are able to interpret data using frequency graphs and box plots. In particular, this unit aims to identify and help students who have difficulty figuring out the data points and spread of data from frequency graphs and box plots. It is advisable to use the first lesson in the unit, Representing Data 1: Frequency Graphs (32498), before this one.
Sea Ice Analysis:	The changing climate is an important topic for both scientific analysis and worldly knowledge. This lesson uses data collected by the National Snow and Ice Data Center to create and use statistical analysis as a tool to evaluate the sea ice loss. Students will use technology to quickly generate graphs for each month looking for trends, patterns or deviations over time.
Sea Ice Analysis Algebra:	The changing climate is an important topic for both scientific analysis and worldly knowledge. This lesson uses data collected by the National Snow and Ice Data Center to create and use statistical analysis as a tool to evaluate the sea ice loss. Students will use technology to quickly generate graphs for each month looking for trends, patterns, or deviations over time.
Sensoring Data:	In this follow up lesson, students will explore data collection using the weather station sensor and perform statistical analysis of the data. Students will use a scientific method of inquiry to plan an investigation of their own. This activity is meant to allow students to use a variety of skills they have acquired throughout a statistics unit in a personally meaningful way.
Sensoring Data:	In this follow up lesson, students will explore data collection using the weather station sensor and perform statistical analysis of the data. Students will use a scientific method of inquiry to plan an investigation of their own. This activity is meant to allow students to use a variety of skills they have acquired throughout a statistics unit in a personally meaningful way.
The Distance a Coin Will Travel:	This lesson is a hands on activity that will allow students to collect and display data about how far different coins will travel. The data collected is then used to construct double dot plots and double box plots. This activity helps to facilitate the statistical implications of data collection and the application of central tendency and variability in data collection.
What's Your Tendency?:	This resource can be used to teach students how to create and compare box plots. After completing this lesson, students should be able to answer questions in both familiar and unfamiliar situations.
Which One: Box plot, Dot Plot, or Histogram?:	Students will be asked to obtain data and create a human box plot, which will be analyzed and explained using statistical terms. Students will then understand the differences and advantages to using the box plot, histogram, and dot plot. Students will also be able to identify which one should be used for a specified set of data.
Who's Better?--Using Data to Determine:	This lesson is intended for use after students are able to construct data plots (histograms, line plots, box plots). Students are tasked with not only constructing data plots, but also matching data plots to data sets. In the summative assessment, students are given two data sets and asked to select which of three data plots (histogram, line plot, or box plot) would best be used to compare the data. After choosing and constructing their plot, students are then tasked with forming a conclusion based on the plots they have constructed.

Virtual Manipulative

Name	Description
Advanced Data Grapher:	This is an online graphing utility that can be used to create box plots, bubble graphs, scatterplots, histograms, and stem-and-leaf plots.
Box Plot:	In this activity, students use preset data or enter in their own data to be represented in a box plot. This activity allows students to explore single as well as side-by-side box plots of different data. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and

	exploration questions for use with the Java applet.
Histogram:	In this activity, students can create and view a histogram using existing data sets or original data entered. Students can adjust the interval size using a slider bar, and they can also adjust the other scales on the graph. This activity allows students to explore histograms as a way to represent data as well as the concepts of mean, standard deviation, and scale. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Histogram Tool:	This virtual manipulative histogram tool can aid in analyzing the distribution of a dataset. It has 6 preset datasets and a function to add your own data for analysis.
Histogram vs. Box Plot:	This simulation allows the student to create a box plot and a histogram for the same set of data and toggle between the two displays. Maximum, minimum, median and mean are shown for the data set. The student can change the cell width to explore how the histogram is affected.
Univariate and Bivariate Data:	This lesson is designed to introduce students to the difference between univariate and bivariate data, and how the two can be represented graphically. This lesson provides links to model discussions and online graphing applets, as well as suggested ways to integrate them into the lesson. Finally, the lesson provides links to follow-up lessons designed for use in succession with the current one.

Perspectives Video: Professional/Enthusiast

Name	Description
Graphs Help Identify Cost-Effective Sea Turtle Conservation Strategies:	This marine biologist discusses her use of graphical representations to help determine the most cost-effective management strategies for sea turtle conservation.

Problem-Solving Task

Name	Description
Haircut Costs:	This problem could be used as an introductory lesson to introduce group comparisons and to engage students in a question they may find amusing and interesting.
Random Walk III:	The task provides a context to calculate discrete probabilities and represent them on a bar graph.
Speed Trap:	The purpose of this task is to allow students to demonstrate an ability to construct boxplots and to use boxplots as the basis for comparing distributions.

Perspectives Video: Expert

Name	Description
Histograms Show Trends in Fisheries Data Over Time:	NOAA Fishery management relies on histograms to show patterns and trends over time of fishery data.

Lesson Study Resource Kit

Name	Description
Measurement Matters:	This Lesson Study Resource Kit is an introductory unit on measurement for a Chemistry I course.

Teaching Idea

Name	Description
Now That is a Dense Graph:	In this activity, the density of ethanol is found by graphical means. In the second part, the density of sodium thiosulfate is found, also by graphical means. The values found are then analyzed statistically.
Now That is a Dense Graph:	Students will first measure and plot the total mass vs liquid volume in a graduated cylinder. They will then use slope and the mathematical formula for the plot to determine the density of the liquid, the density of a solid added to the liquid, and the mass of the graduated cylinder.
Pump Up the Volume:	This activity is a statistical analysis of recorded measurements of a single value - in this case, a partially filled graduated cylinder.
Pump Up the Volume:	This activity challenges students to analyze the statistical distribution of volume measurements from a partially filled graduated cylinder. The free app, GeoGebra is used to create a box plot to aid in the analysis.

Professional Development

Name	Description
Representing Data With Graphs: Box Plots:	Strategies to help students in a first Algebra course learn to summarize, represent, and interpret one-variable data. The focus of this tutorial is on representing data with box plots.

Unit/Lesson Sequence

Name	Description
	This sample Algebra 1 CMAP is a fully customizable resource and curriculum-planning tool that provides a framework for the Algebra 1 Course. The units and standards are customizable and the CMAP allows instructors to add lessons, worksheets, and other resources as needed. This CMAP also includes rows that automatically filter and display Math Formative Assessments System tasks, E-Learning Original Student Tutorials and Perspectives Videos that are aligned to the standards, available on CPALMS. Learn more about the sample Algebra 1 CMAP, its features and customizability by watching the following video:

Sample Algebra 1 Curriculum Plan Using CMAP:

Using this CMAP

To view an introduction on the CMAP tool, please click here.

To view the CMAP, click on the "Open Resource Page" button above; be sure you are logged in to your iCPALMS account.

To use this CMAP, click on the "Clone" button once the CMAP opens in the "Open Resource Page." Once the CMAP is cloned, you will be able to see it as a class inside your iCPALMS My Planner (CMAPs) app.

To access your My Planner App and the cloned CMAP, click on the iCPALMS tab in the top menu.

All CMAP tutorials can be found within the iCPALMS Planner App or at the following URL: http://www.cpalms.org/support/tutorials_and_informational_videos.aspx

Student Resources

Name	Description
Advanced Data Grapher:	This is an online graphing utility that can be used to create box plots, bubble graphs, scatterplots, histograms, and stem-and-leaf plots.
Box Plot:	In this activity, students use preset data or enter in their own data to be represented in a box plot. This activity allows students to explore single as well as side-by-side box plots of different data. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the Java applet.
Haircut Costs:	This problem could be used as an introductory lesson to introduce group comparisons and to engage students in a question they may find amusing and interesting.
Histogram:	In this activity, students can create and view a histogram using existing data sets or original data entered. Students can adjust the interval size using a slider bar, and they can also adjust the other scales on the graph. This activity allows students to explore histograms as a way to represent data as well as the concepts of mean, standard deviation, and scale. This activity includes supplemental materials, including background information about the topics covered, a description of how to use the application, and exploration questions for use with the java applet.
Histogram Tool:	This virtual manipulative histogram tool can aid in analyzing the distribution of a dataset. It has 6 preset datasets and a function to add your own data for analysis.
Histogram vs. Box Plot:	This simulation allows the student to create a box plot and a histogram for the same set of data and toggle between the two displays. Maximum, minimum, median and mean are shown for the data set. The student can change the cell width to explore how the histogram is affected.
Random Walk III:	The task provides a context to calculate discrete probabilities and represent them on a bar graph.
Speed Trap:	The purpose of this task is to allow students to demonstrate an ability to construct boxplots and to use boxplots as the basis for comparing distributions.

Parent Resources

Name	Description
Haircut Costs:	This problem could be used as an introductory lesson to introduce group comparisons and to engage students in a question they may find amusing and interesting.
Histogram vs. Box Plot:	This simulation allows the student to create a box plot and a histogram for the same set of data and toggle between the two displays. Maximum, minimum, median and mean are shown for the data set. The student can change the cell width to explore how the histogram is affected.
Random Walk III:	The task provides a context to calculate discrete probabilities and represent them on a bar graph.

Speed Trap:	The purpose of this task is to allow students to demonstrate an ability to construct boxplots and to use boxplots as the basis for comparing distributions.