Core Content

Cluster Title:Summarize, represent, and interpret data on a single count or measurement variable.
Standard S.ID.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).
Concepts and Skills to Master
• Graph numerical data on a real number line using dot plots, histograms, and box plots. • Describe and give a simple interpretation of a graphical representation of data. • Determine which type of data plot would bemost appropriate for a specific situation

Supports for Teachers

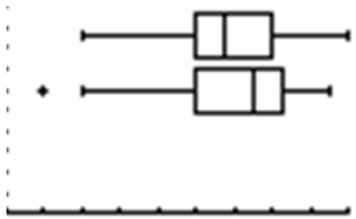
Critical Background Knowledge	
• Know how to compute a median. • Find the lower extreme (minimum), upper extreme (maximum), and quartiles.	
Academic Vocabulary	
Dot plot, histogram, box plot, quartiles, lower extreme (minimum), upper extreme (maximum), median, outlier	
Suggested Instructional Strategies	**Resources**
• Gather or provide data and have students plot each type of graph. • Analyze the strengths and weakness inherent in each type of plot by comparing different plots of the same data. • Have students collect their own data and choose a graph to represent it.	http://www.freestatistics.info (data sets) http://lib.stat.cmu.edu/DASL (data sets) National Library of Virtual Manipulatives (box plots and histograms) *Making it Happen*, NCTM 2011

Sample Formative Assessment Tasks	
Skill-based Task: The following data set shows the number of songs downloaded in one week by each student in Mrs. Jones' class: 10, 20, 12, 14, 12, 27, 88, 2, 7, 30, 16, 16, 32, 15, 25, 15, 4, 0, 15, 6. Choose and create a plot to represent the data.	**Problem Task:** On the midterm math exam, students had the following scores: 95, 45, 37, 82, 90, 100, 91, 78, 67, 84, 85, 85, 82, 91, 92, 93, 92, 76, 84, 100, 59, 92, 77, 68, 88. What are the strengths and weaknesses of presenting this data in a certain type of plot for: • Students in a class? • Parents? • The school board?

Core Content

Cluster Title: Summarize, represent, and interpret data on a single count or measurement variable.
Standard S.ID.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
Concepts and Skills to Master
• Given two sets of data or two graphs, identify similarities and differences in shape, center and spread. • Compare data sets and be able to summarize the similarities and differences between the shape, and measures of centers and spreads of the data sets.

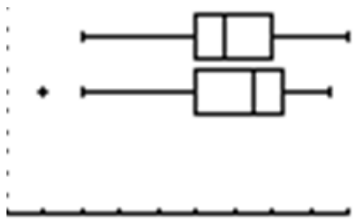
Supports for Teachers

Critical Background Knowledge	
• Know how to compute the mean, median, interquartile range, and standard deviation by hand in simple cases and using technology with larger data sets. • Create a graphical representation of a data set.	
Academic Vocabulary	
Mean, median, interquartile range, standard deviation, center, spread, shape	
Suggested Instructional Strategies	**Resources**
• Use technology to manipulate plots of data sets to explore how changing data affects the measures of center and spread. • Discuss what it means when related data sets have differing centers or spreads in relation to the context.	http://lib.stat.cmu.edu/DASL/ (data sets) http://www.freestatistics.info (data sets)
Sample Formative Assessment Tasks	
Skill-based Task: The boxplots show the distribution of scores on a district writing test in two fifth grade classes at a school. Compare the range and medians of the scores from the two classes. 	**Problem Task:** Plot data based on populations of European countries. Plot data based on populations of Asian countries. Compare and discuss differences in center and spread.

Core Content

Cluster Title: Summarize, represent, and interpret data on a single-count or measurement variable.
Standard S.ID.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
Concepts and Skills to Master
• Given two sets of data or two graphs, identify similarities and differences in shape, center and spread. • Interpret similarities and differences between the shape, and measures of centers and spreads of data sets. • State the effects of any existing outliers.

Supports for Teachers

Critical Background Knowledge	
• Know how to compute the mean, median, interquartile range, and standard deviation by hand in simple cases and using technology with larger data sets. • Create a graphical representation of a data set.	
Academic Vocabulary	
Extreme data point (outliers), skewed, center, spread	
Suggested Instructional Strategies	**Resources**
• Use data from multiple sources to interpret differences in shape, center and spread. • Use data that includes outliers and explore what happens when outliers are removed. • Discuss the effect of outliers on measures of center and spread and the effect on the shape.	http://lib.stat.cmu.edu/DASL/ (data sets) http://www.freestatistics.info (data sets)
Sample Formative Assessment Tasks	
Skill-based Task: The boxplots show the distribution of scores on a district writing test in two fifth grade classes at a school. Which class performed better and why? 	**Problem Task:** Find two similar data sets A and B (use textbook or internet resources). What changes would need to be made to data set A to make it look like the graph of set B?

Core Content

Cluster Title: Summarize, represent, and interpret data on two categorical and quantitative variables.
Standard S.ID.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
Concepts and Skills to Master
• Create a two-way frequency table showing the relationship between two categorical variables. • Find and interpret joint, marginal and conditional relative frequencies. • Analyze possible associations and trends in the data.

Supports for Teachers

Critical Background Knowledge	
• Present data in a frequency table.	
Academic Vocabulary	
Categorical data, two-way frequency table, relative frequency, joint frequency, marginal frequency, conditional relative frequencies, trends.	
Suggested Instructional Strategies	**Resources**
• Use contextual situations to have students create a two-way frequency table showing the relationship between two categorical variables such as height and weight or blood pressure and incidence of heart disease. • Use technology to create two-way tables. • Compare various tables and discuss frequencies that are evident.	*Making it Happen* (NCTM)

Sample Formative Assessment Tasks

Skill-based Task: What is the joint frequency of students who have chores and a curfew? Which marginal frequency is the largest?

	Curfew: Yes	Curfew: No	Total
Chores: Yes	13	5	18
Chores: No	12	3	15
Total	25	8	

Problem Task: Collect data that compares populations of countries with square miles. What trends emerge when we compare living in geographically large countries with those that are highly populated?

Core Content

Cluster Title: Summarize, represent, and interpret data on two categorical and quantitative variables.
Standard S.ID.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for scatter plots that suggest a linear association.
Concepts and Skills to Master
• Create a scatter plot of bivariate data and estimate a linear or exponential function that fits the data and use this function to solve problems in the context of the data. • Find residuals using technology and analyze their meaning. • Fit a linear function (trend line) to a scatter plot with and without technology.

Supports for Teachers

Critical Background Knowledge	
• Plot data on a coordinate grid and graph a linear function. • Recognize characteristics of linear and exponential functions. • Write an equation of a line given two points.	
Academic Vocabulary	
Function, linear model, exponential model, bivariate, residuals, scatter plot, correlation	
Suggested Instructional Strategies	**Resources**
• Create a scatter plot for the data, find a trend line and evaluate the fit by analyzing residuals.	*Making it Happen* (NCTM)
Sample Formative Assessment Tasks	
Skill-based Task: The following data shows the age and average daily energy requirements for male children and teens (1, 1110), (2, 1300), (5, 1800), (11, 2500), (14, 2800), (17, 3000). Create a graph and find a linear function to fit the data. Using your function, what is the daily energy requirement for a male 15 years old? Would your model apply to an adult male? Explain.	**Problem Task:** Collect data on forearm length and height in a class. Plot the data and estimate a linear function for the data. Compare and discuss different student representations of the data and equations they discover. Could the equation(s) be used to estimate the height for any person with a known forearm length? Why or why not?

Core Content

Cluster Title: Interpret linear models.
Standard S.ID.7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
Concepts and Skills to Master
• Explain what the slope means in the context of the situation. • Explain what the intercept means in context of the data.

Supports for Teachers

Critical Background Knowledge	
• Graph data in a scatter plot and determine a trend line. • Determine the slope of a line from any representation. • Identify the y-intercept from any representation.	
Academic Vocabulary	
Slope (rate of change), intercept linear model	
Suggested Instructional Strategies	**Resources**
• Find and graph data sets from the internet and discuss the meaning of their slopes and intercepts in context.	http://lib.stat.cmu.edu/DASL/ (data sets) http://www.freestatistics.info (data sets)
Sample Formative Assessment Tasks	
Skill-based Task: Collect power bills and graph the cost of electricity compared to the number of kilowatt hours used. Find a function that models the data and tell what the intercept and slope mean in the context of the problem.	**Problem Task:** Create a poster of bivariate data with a linear relationship. Describe for the class the meaning of the data, including the meaning of the slope and intercept in the context of the data.

Core Content

Cluster Title: Interpret linear models.
Standard S.ID.8: Compute (using technology) and interpret the correlation coefficient of a linear fit.
Concepts and Skills to Master
• Compute the correlation coefficient of a set of linearly related data using technology. • Determine whether the correlation coefficient shows a weak positive, strong positive, weak negative, strong negative, or no correlation.

Supports for Teachers

Critical Background Knowledge	
• Be able to use graphing technology.	
Academic Vocabulary	
Correlation coefficient, linear fit, positive correlation, negative correlation, no correlation	
Suggested Instructional Strategies	**Resources**
• Have students enter data into graphing technology, calculate the regression equation, and interpret what the correlation coefficient is telling about the data.	http://www.freestatistics.info (data sets) http://lib.stat.cmu.edu/DASL (data sets)
Sample Formative Assessment Tasks	
Skill-based Task: The correlation coefficient of a given data set is 0.97. List three specific things this tells you about the data.	**Problem Task:** Hypothesize the correlation between two sets of seemingly related data. Gather data to support or refute your hypothesis.

Core Content

Cluster Title: Interpret linear models.
Standard S.ID.9: Distinguish between correlation and causation.
Concepts and Skills to Master
• Understand the difference between correlation and causation. • Understand and explain that a strong correlation does not mean causation.

Supports for Teachers

Critical Background Knowledge	
• Understand the meaning of correlation.	
Academic Vocabulary	
correlation, causation	
Suggested Instructional Strategies	**Resources**
• Discuss data that has correlation but no causation (height vs. foot length). • Discuss data that has correlation and causation (number of M&Ms in a cup vs. the weight of the cup).	*Making it Happen* (NCTM)
Sample Formative Assessment Tasks	
Skill-based Task: Give an example of a data set that has strong correlation but no causation and describe why this is so. Give an example of a data set that has both strong correlation and causation and write a description of why this is so.	**Problem Task:** Find media artifacts that make claims of causation and evaluate them.