IM 9–12 MATH v.1

Unit 1
Sequences and Functions

ALGEBRA 1

Lesson 11

Comparing and Contrasting Data Distributions

Illustrative Mathematics®

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Learning Goal

Let's investigate variability using data displays and summary statistics.

Algebra 1

Math Talk: Mean

Warm-up: Math Talk

Evaluate the mean of each data set mentally.

27, 30, 33

61, 71, 81, 91, 101

0, 100, 100, 100, 100

0, 5, 6, 7, 12

Describing Data Distributions

1. Your teacher will give you a set of cards. Take turns with your partner to match a data display with a written statement.
   a. For each match that you find, explain to your partner how you know it's a match.
   b. For each match that your partner finds, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.
2. After matching, determine if the mean or median is more appropriate for describing the center of the data set based on the distribution shape. Discuss your reasoning with your partner. If it is not given, calculate (if possible) or estimate the appropriate measure of center. Be prepared to explain your reasoning.

- Which matches were tricky? Explain why.
- Did you need to make adjustments in your matches? What might have caused an error? What adjustments were made?
- Can you determine the median using only a histogram? Why or why not?
- Can you determine if a distribution is uniform from a box plot? Why or why not?
- If the mean is the appropriate measure of center, should we use the MAD or the IQR to measure variability?
- If the median is the appropriate measure of center, should we use the MAD or the IQR to measure variability?

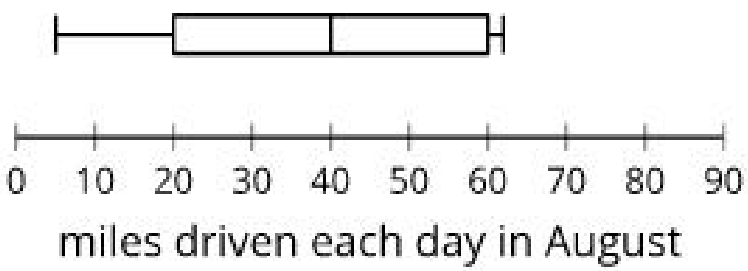
Visual Variability and Statistics

Each box plot summarizes the number of miles driven each day for 30 days in each month. The box plots represent, in order, the months of August, September, October, November, and December.

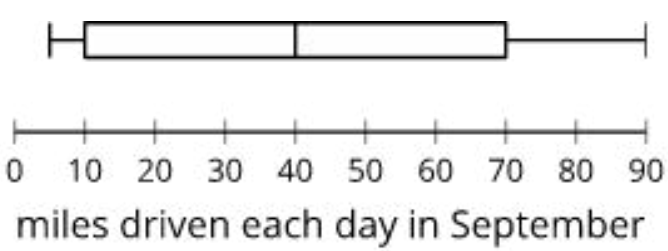
1. The five box plots have the same median. Explain why the median is more appropriate for describing the center of the data set than the mean for these distributions.
2. Arrange the box plots in order of least variability to greatest variability. Check with another group to see if they agree.

Visual Variability and Statistics

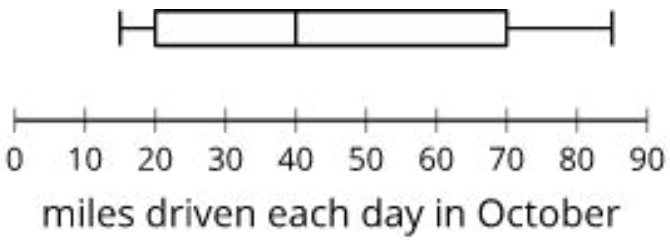
a.



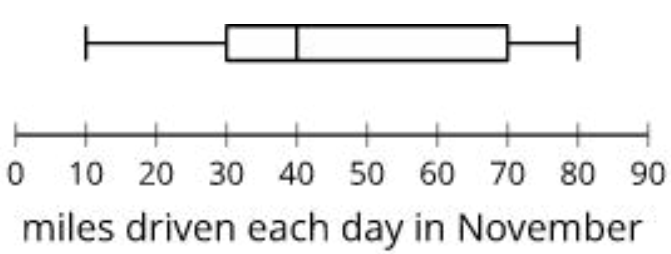
b.



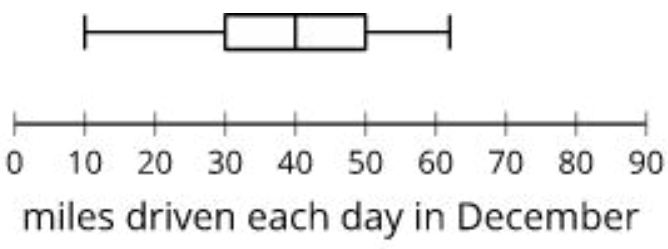
c.



d.



e.

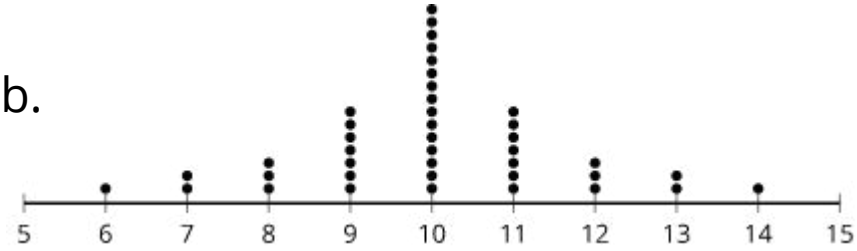


Visual Variability and Statistics

3. The five dot plots have the same mean. Explain why the mean is more appropriate for describing the center of the data set than the median.
4. Arrange the dot plots in order of least variability to greatest variability. Check with another group to see if they agree.

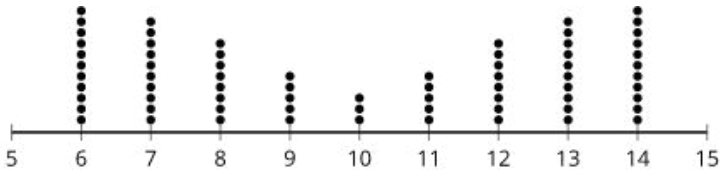
a.

b.



Visual Variability and Statistics

c.



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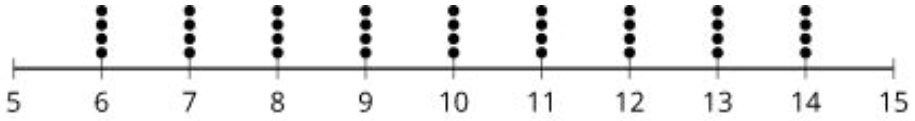
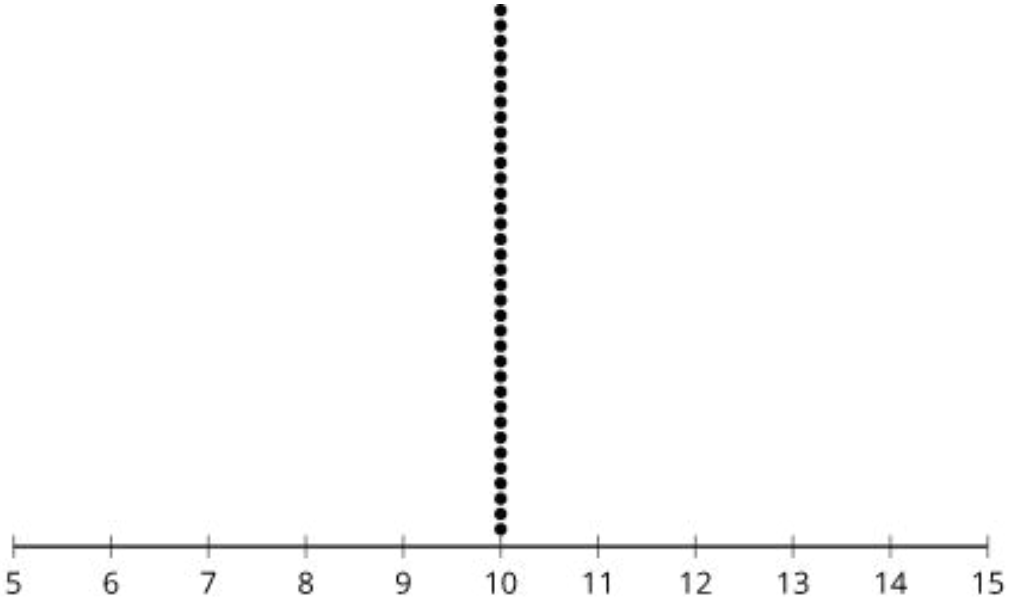
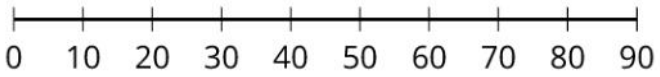


e.



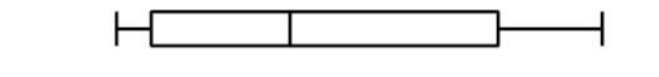
Visual Variability and Statistics

IQR: 20



miles driven each day in December

IQR: 50

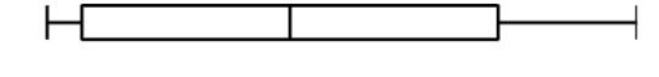


miles driven each day in October

IQR: 40

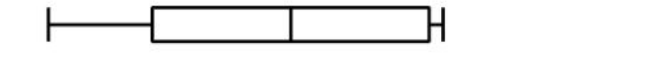
miles driven each day in November

IQR: 60



miles driven each day in September

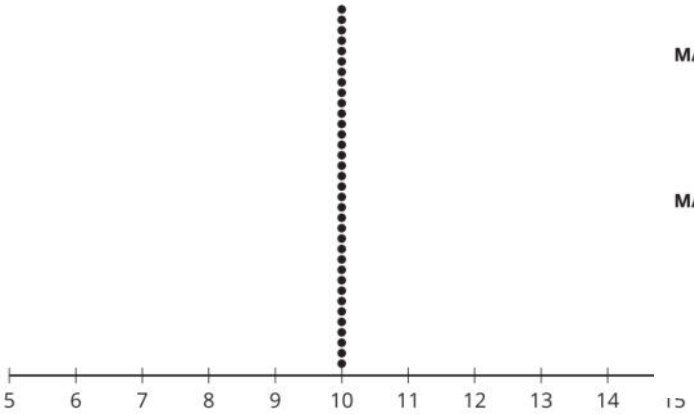
IQR: 40



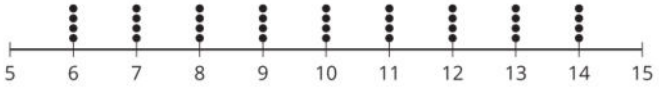
miles driven each day in August

Visual Variability and Statistics

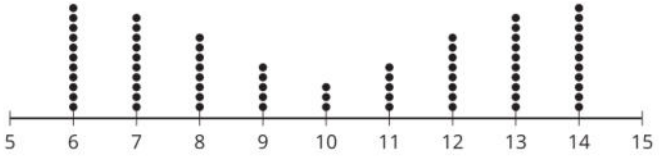
MAD: 0



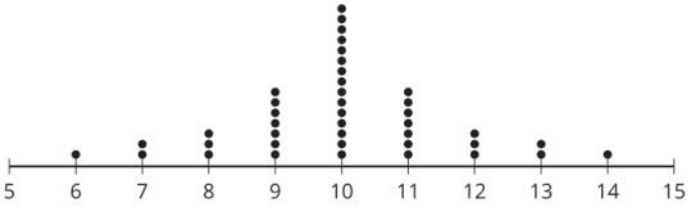
MAD: 2.22



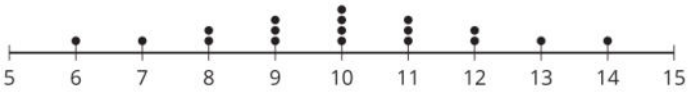
MAD: 2.68



MAD: 1.12



MAD: 1.56



Visual Variability and Statistics

- What are the IQR and MAD measuring?
- Which plots were the most difficult to arrange?
- Do the orders given by the IQR and MAD match your order?
- What do you notice about the values for IQR and MAD?
- What advantages are offered by using IQR and MAD versus visual inspection?

Comparing and Contrasting Data Distributions

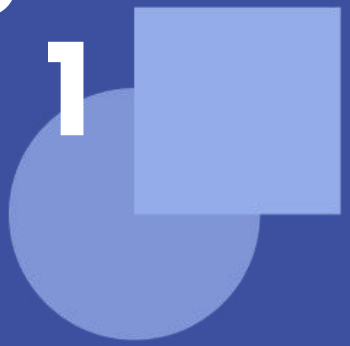
Lesson Synthesis

- One data set's measure of center is best represented by a median of 7 and another data set by a median of 10. How would you determine which data set has greater variability?
- How do you determine which of two roughly symmetric distributions has less variability?
- What does it mean to say that one data set or distribution has more variability than another?

I can arrange data sets in order of variability given graphic representations.

Learning Targets

Algebra 1



Which Menu?

Cool-down

A restaurant owner believes that it is beneficial to have different menu items with a lot of variability so that people can have a choice of expensive and inexpensive food. Several chefs offer menus and suggested prices for the food they create. The owner creates dot plots for the prices of the menu items and finds some summary statistics. Which menu best matches what the restaurant is looking for? Explain your reasoning.

Which Menu?

Cool-down

Italian:

mean: $9.03

median: $9

MAD: $2.45

IQR: $3.50

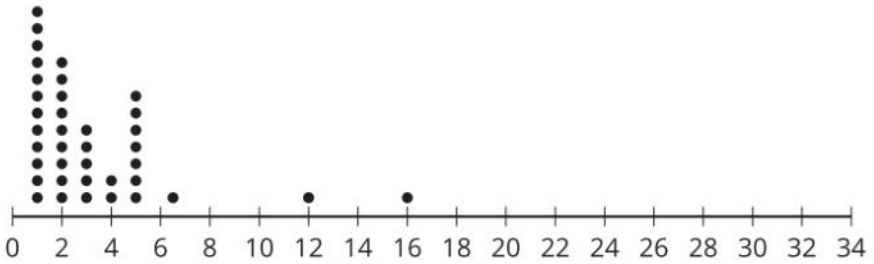
Diner:

mean: $3.36

median: $2

MAD: $2.12

IQR: $4



Japanese:

mean: $10.35

median: $10

MAD: $5.55

IQR: $9.50

statistic

A quantity that is calculated from sample data, such as mean, median, or MAD (mean absolute deviation).