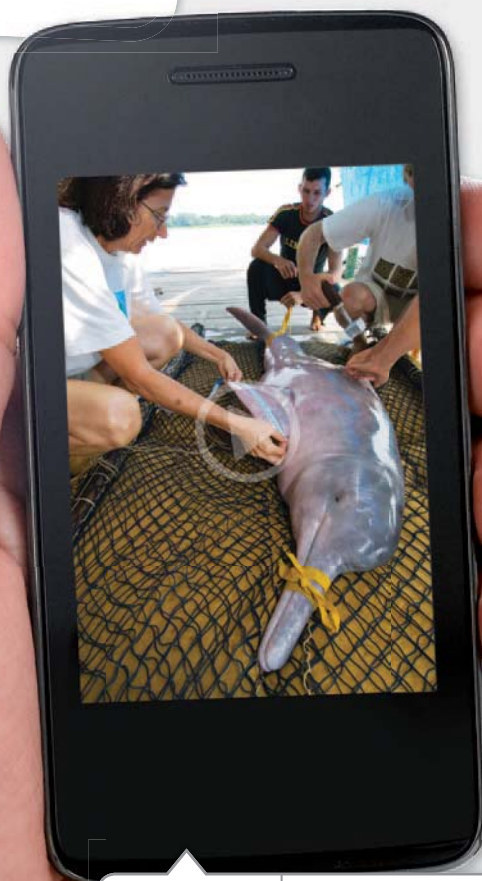


Analyzing and Comparing Data



ESSENTIAL QUESTION

How can you use solve real-world problems by analyzing and comparing data?



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Real-World Video

Scientists study animals like dolphins to learn more about characteristics such as behavior, diet, and communication. Acoustical data (recordings of dolphin sounds) can reveal the species that made the sound.

MODULE



11

LESSON 11.1

Comparing Data Displayed in Dot Plots



7.SP.3, 7.SP.4

LESSON 11.2

Comparing Data Displayed in Box Plots



7.SP.3, 7.SP.4

LESSON 11.2

Using Statistical Measures to Compare Populations



7.SP.3, 7.SP.4



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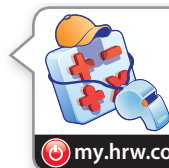


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Are YOU Ready?

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Fractions, Decimals, and Percents

EXAMPLE Write $\frac{13}{20}$ as a decimal and a percent.

$$\begin{array}{r} 0.65 \\ 20 \overline{)13.00} \\ \underline{-120} \\ 100 \\ \underline{-100} \\ 0 \end{array}$$

$0.65 = 65\%$

Write the fraction as a division problem. Write a decimal point and zeros in the dividend.

Place a decimal point in the quotient.

Write the decimal as a percent.

Write each fraction as a decimal and a percent.

1. $\frac{7}{8}$ _____
2. $\frac{4}{5}$ _____
3. $\frac{1}{4}$ _____
4. $\frac{3}{10}$ _____
5. $\frac{19}{20}$ _____
6. $\frac{7}{25}$ _____
7. $\frac{37}{50}$ _____
8. $\frac{29}{100}$ _____

Find the Median and Mode

EXAMPLE 17, 14, 13, 16, 13, 11
11, 13, 13, 14, 16, 17

median = $\frac{13 + 14}{2} = 13.5$
mode = 13

Order the data from least to greatest.

The median is the middle item or the average of the two middle items.

The mode is the item that appears most frequently in the data.

Find the median and the mode of the data.

9. 11, 17, 7, 6, 7, 4, 15, 9 _____
10. 43, 37, 49, 51, 56, 40, 44, 50, 36 _____

Find the Mean

EXAMPLE 17, 14, 13, 16, 13, 11

mean = $\frac{17 + 14 + 13 + 16 + 13 + 11}{6}$
= $\frac{84}{6}$
= 14

The mean is the sum of the data items divided by the number of items.

Find the mean of the data.

11. 9, 16, 13, 14, 10, 16, 17, 9 _____
12. 108, 95, 104, 96, 97, 106, 94 _____

Reading Start-Up

Visualize Vocabulary

Use the ✓ words to complete the right column of the chart.

Statistical Data		
Definition	Example	Review Word
A group of facts.	Grades on history exams: 85, 85, 90, 92, 94	
The middle value of a data set.	85, 85, 90, 92, 94	
A value that summarizes a set of values, found through addition and division.	Results of the survey show that students typically spend 5 hours a week studying.	

Understand Vocabulary

Complete each sentence using the preview words.

1. A display that uses values from a data set to show how the values are spread out is a _____.
2. A _____ uses a number line to display data.

Vocabulary

Review Words

- ✓ data (*datos*)
interquartile range (*rango entre cuartiles*)
- ✓ mean (*media*)
measure of center (*medida central*)
measure of spread (*medida de dispersión*)
- ✓ median (*mediana*)
survey (*encuesta*)

Preview Words

- box plot (*diagrama de caja*)
- dot plot (*diagrama de puntos*)
- mean absolute deviation (MAD) (*desviación absoluta media, (DAM)*)

Active Reading

Layered Book Before beginning the module, create a layered book to help you learn the concepts in this module. Label the first flap with the module title. Label the remaining flaps with the lesson titles. As you study each lesson, write important ideas, such as vocabulary and formulas, under the appropriate flap. Refer to your finished layered book as you work on exercises from this module.





Unpacking the Standards

Understanding the standards and the vocabulary terms in the standards will help you know exactly what you are expected to learn in this module.

COMMON
CORE

7.SP.3

Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

Key Vocabulary

measure of center (*medida de centro*)

A measure used to describe the middle of a data set; the mean and median are measures of center.

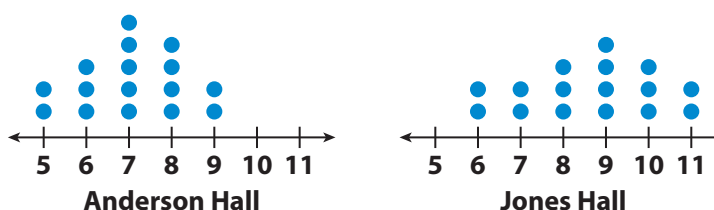
What It Means to You

You will compare two populations based on random samples.

UNPACKING EXAMPLE 7.SP.3

Melinda surveys a random sample of 16 students from two college dorms to find the average number of hours of sleep they get. Use the results shown in the dot plots to compare the two populations.

Average Daily Hours of Sleep



Students in Jones Hall tend to sleep more than students in Anderson Hall, but the variation in the data sets is similar.

COMMON
CORE

7.SP.3

Informally assess... distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

Key Vocabulary

measure of spread (*medida de la dispersión*)

A measure used to describe how much a data set varies; the range, IQR, and mean absolute deviation are measures of spread.

What It Means to You

You will compare two groups of data by comparing the difference in the means to the variability.

UNPACKING EXAMPLE 7.SP.3

The tables show the number of items that students in a class answered correctly on two different math tests. How does the difference in the means of the data sets compare to the variability?

Items Correct on Test 1

20, 13, 18, 19, 15, 18, 20, 20, 15, 15, 19, 18

Mean: 17.5; Mean absolute deviation: 2

Items Correct on Test 2

8, 12, 12, 8, 15, 16, 14, 12, 13, 9, 14, 11

Mean: 12; Mean absolute deviation: 2

The means of the two data sets differ by $\frac{17.5-12}{2}=2.75$ times the variability of the data sets.



Visit my.hrw.com to see all the **Common Core Standards** unpacked.

LESSON 11.1

Comparing Data Displayed in Dot Plots

COMMON
CORE

7.SP.4

Use measures of center and measures of variability ... to draw informal comparative inferences about two populations. *Also 7.SP.3*



ESSENTIAL QUESTION

How do you compare two sets of data displayed in dot plots?

EXPLORE ACTIVITY



COMMON
CORE

7.SP.4

Analyzing Dot Plots

You can use dot plots to analyze a data set, especially with respect to its center and spread.

People once used body parts for measurements.

For example, an inch was the width of a man's

thumb. In the 12th century, King

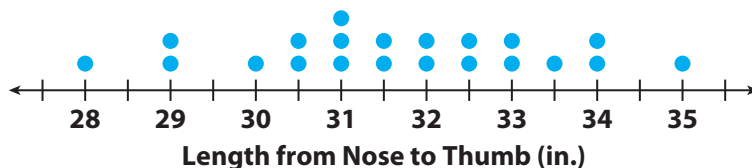
Henry I of England stated that a yard

was the distance from his nose to his

outstretched arm's thumb. The dot plot

shows the different lengths, in inches,

of the "yards" for students in a 7th grade class.



- A** Describe the shape of the dot plot. Are the dots evenly distributed or grouped on one side?

- B** Describe the center of the dot plot. What single dot would best represent the data?

- C** Describe the spread of the dot plot. Are there any outliers?

Reflect

1. Calculate the mean, median, and range of the data in the dot plot.



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Comparing Dot Plots Visually

You can compare dot plots visually using various characteristics, such as center, spread, and shape.

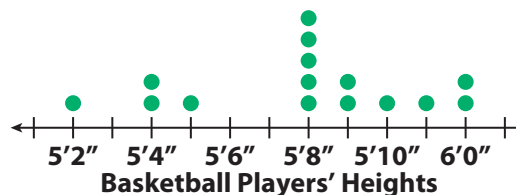
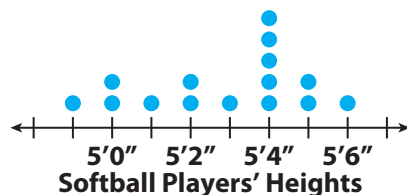
EXAMPLE 1



COMMON
CORE

7.SP.3

The dot plots show the heights of 15 high school basketball players and the heights of 15 high school softball players.



A Visually compare the shapes of the dot plots.

Softball: All the data is 5'6" or less.

Basketball: Most of the data is 5'8" or greater.

As a group, the **softball** players are shorter than the **basketball** players.

B Visually compare the centers of the dot plots.

Softball: The data is centered around 5'4".

Basketball: The data is centered around 5'8".

This means that the most common height for the **softball** players is 5 feet 4 inches, and for the **basketball** players 5 feet 8 inches.

C Visually compare the spreads of the dot plots.

Softball: The spread is from 4'11" to 5'6".

Basketball: The spread is from 5'2" to 6'0".

There is a greater spread in heights for the **basketball** players.

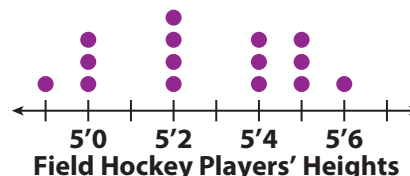
Math Talk

Mathematical Practices

How do the heights of field hockey players compare with the heights of softball and basketball players?

YOUR TURN

2. Visually compare the dot plot of heights of field hockey players to the dot plots for softball and basketball players.



Shape: _____

Center: _____

Spread: _____



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Comparing Dot Plots Numerically

You can also compare the shape, center, and spread of two dot plots numerically by calculating values related to the center and spread. Remember that outliers can affect your calculations.

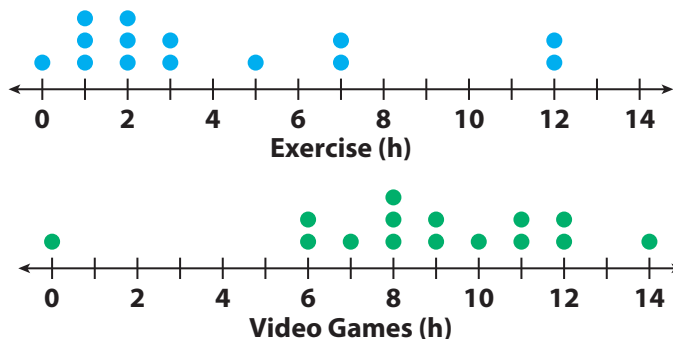
EXAMPLE 2



COMMON
CORE

7.SP.4

Numerically compare the dot plots of the number of hours a class of students exercises each week to the number of hours they play video games each week.



A Compare the shapes of the dot plots.

Exercise: Most of the data is less than 4 hours.

Video games: Most of the data is 6 hours or greater.

B Compare the centers of the dot plots by finding the medians.

Median for exercise: 2.5 hours. Even though there are outliers at 12 hours, most of the data is close to the median.

Median for video games: 9 hours. Even though there is an outlier at 0 hours, these values do not seem to affect the median.

C Compare the spreads of the dot plots by calculating the range.

Exercise range with outlier: $12 - 0 = 12$ hours

Exercise range without outlier: $7 - 0 = 7$ hours

Video games range with outlier: $14 - 0 = 14$ hours

Video games range without outlier: $14 - 6 = 8$ hours

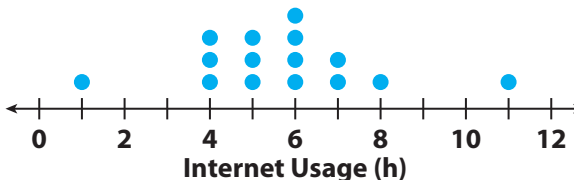
Math Talk

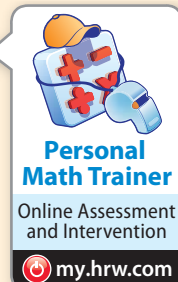
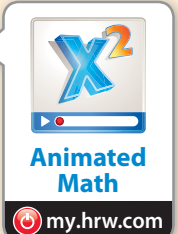
Mathematical Practices

How do outliers affect the results of this data?

YOUR TURN

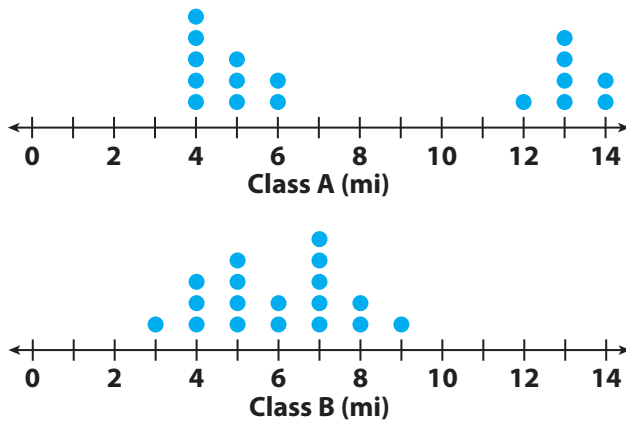
3. Calculate the median and range of the data in the dot plot. Then compare the results to the dot plot for Exercise in Example 2.





Guided Practice

The dot plots show the number of miles run per week for two different classes. For 1–5, use the dot plots shown.



1. Compare the shapes of the dot plots.

2. Compare the centers of the dot plots.

3. Compare the spreads of the dot plots.

4. Calculate the medians of the dot plots.

5. Calculate the ranges of the dot plots.

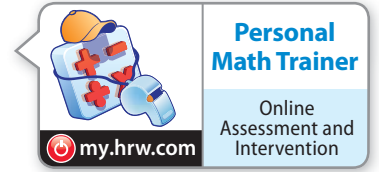


ESSENTIAL QUESTION CHECK-IN

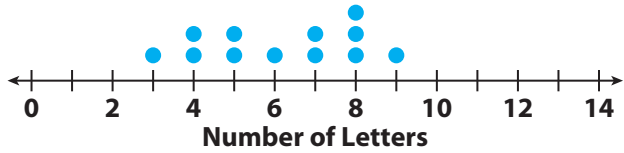
6. What do the medians and ranges of two dot plots tell you about the data?

11.1 Independent Practice

COMMON CORE 7.SP.3, 7.SP.4



The dot plot shows the number of letters in the spellings of the 12 months. Use the dot plot for 7–10.



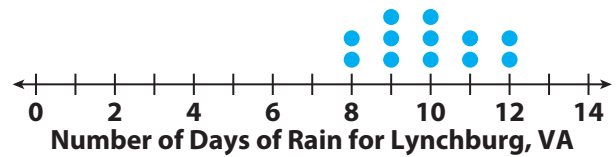
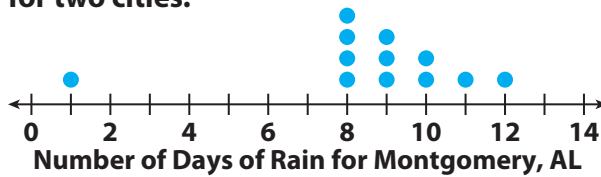
7. Describe the shape of the dot plot.

8. Describe the center of the dot plot.

9. Describe the spread of the dot plot.

10. Calculate the mean, median, and range of the data in the dot plot.

The dot plots show the mean number of days with rain per month for two cities.



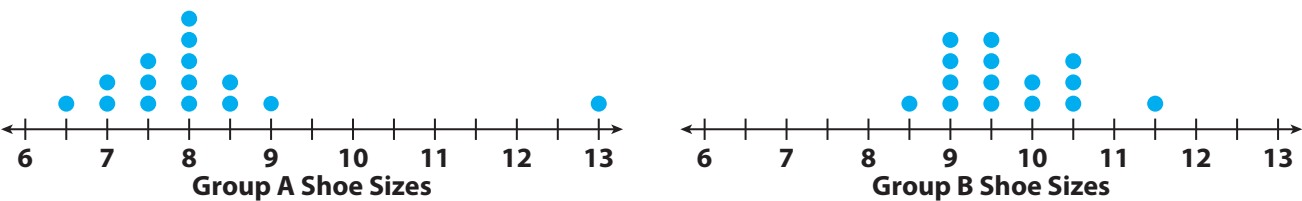
11. Compare the shapes of the dot plots.

12. Compare the centers of the dot plots.

13. Compare the spreads of the dot plots.

14. What do the dot plots tell you about the two cities with respect to their average monthly rainfall?

The dot plots show the shoe sizes of two different groups of people.



- 15. Compare the shapes of the dot plots.

- 16. Compare the medians of the dot plots.

- 17. Compare the ranges of the dot plots (with and without the outliers).

- 18. **Make A Conjecture** Provide a possible explanation for the results of the dot plots.

H.O.T. FOCUS ON HIGHER ORDER THINKING

- 19. **Analyze Relationships** Can two dot plots have the same median and range but have completely different shapes? Justify your answer using examples.

- 20. **Draw Conclusions** What value is most affected by an outlier, the median or the range? Explain. Can you see these effects in a dot plot?

Work Area

LESSON 11.2 Comparing Data Displayed in Box Plots

COMMON CORE 7.SP.3

Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, ... Also 7.SP.4



ESSENTIAL QUESTION

How do you compare two sets of data displayed in box plots?

EXPLORE ACTIVITY

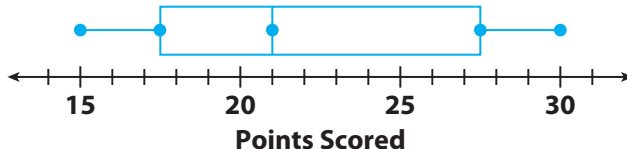


COMMON CORE 7.SP.4

Analyzing Box Plots

Box plots show five key values to represent a set of data, the least and greatest values, the lower and upper quartile, and the median. To create a box plot, arrange the data in order, and divide them into four equal-size parts or quarters. Then draw the box and the whiskers as shown.

The number of points a high school basketball player scored during the games he played this season are organized in the box plot shown.



- A** Find the least and greatest values.

Least value: _____ Greatest value: _____

- B** Find the median and describe what it means for the data.

- C** Find and describe the lower and upper quartiles.

- D** The interquartile range is the difference between the lower and upper quartiles, which is represented by the length of the box. Find the interquartile range.

$$Q_3 - Q_1 = \underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Math Talk

Mathematical Practices

How do the lengths of the whiskers compare? Explain what this means.

Reflect

1. Why is one-half of the box wider than the other half of the box?



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Box Plots with Similar Variability

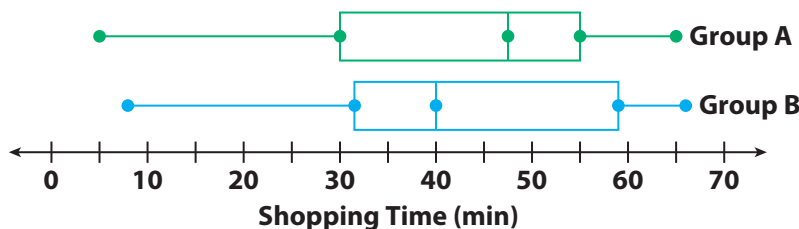
You can compare two box plots numerically according to their centers, or medians, and their spreads, or variability. Range and interquartile range (IQR) are both measures of spread. Box plots with similar variability should have similar boxes and whiskers.

EXAMPLE 1COMMON
CORE

7.SP.3

My Notes

The box plots show the distribution of times spent shopping by two different groups.



- A** Compare the shapes of the box plots.

The positions and lengths of the boxes and whiskers appear to be very similar. In both plots, the right whisker is shorter than the left whisker.

- B** Compare the centers of the box plots.

Group A's median, 47.5, is greater than Group B's, 40. This means that the median shopping time for Group A is 7.5 minutes more.

- C** Compare the spreads of the box plots.

The box shows the interquartile range. The boxes are similar.

Group A: $55 - 30 = 25$ min Group B: About $59 - 32 = 26$ min

The whiskers have similar lengths, with Group A's slightly shorter than Group B's.

Math Talk**Mathematical Practices**

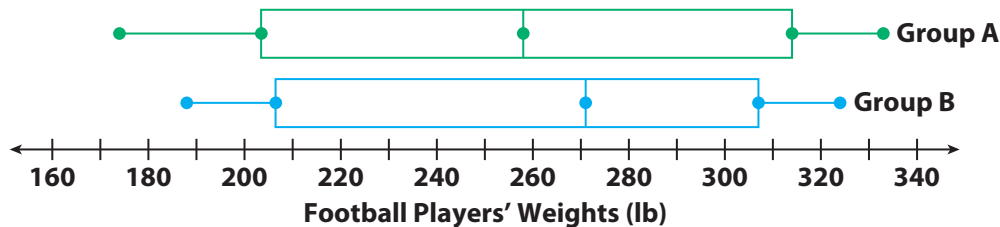
Which store has the shopper who shops longest? Explain how you know.

Reflect

2. Which group has the greater variability in the bottom 50% of shopping times? The top 50% of shopping times? Explain how you know.

YOUR TURN

3. The box plots show the distribution of weights in pounds of two different groups of football players. Compare the shapes, centers, and spreads of the box plots.



Box Plots with Different Variability

You can compare box plots with greater variability, where there is less overlap of the median and interquartile range.

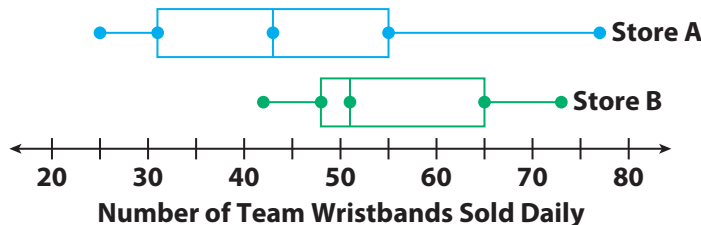
EXAMPLE 2



COMMON
CORE

7.SP.4

The box plots show the distribution of the number of team wristbands sold daily by two different stores over the same time period.



- A** Compare the shapes of the box plots.

Store A's box and right whisker are longer than Store B's.

- B** Compare the centers of the box plots.

Store A's median is about 43, and Store B's is about 51. Store A's median is close to Store B's minimum value, so about 50% of Store A's daily sales were less than sales on Store B's worst day.

- C** Compare the spreads of the box plots.

Store A has a greater spread. Its range and interquartile range are both greater. Four of Store B's key values are greater than Store A's corresponding value. Store B had a greater number of sales overall.



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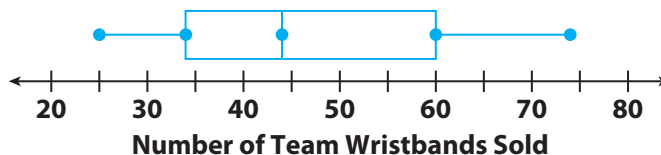
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YOUR TURN

4. Compare the shape, center, and spread of the data in the box plot with the data for Stores A and B in the two box plots in Example 2.



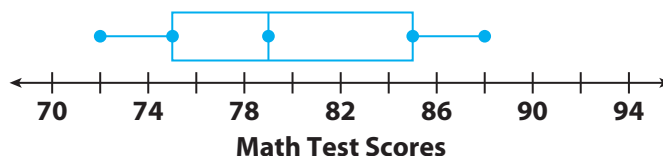
Guided Practice

For 1–3, use the box plot Terrence created for his math test scores. Find each value. (*Explore Activity*)

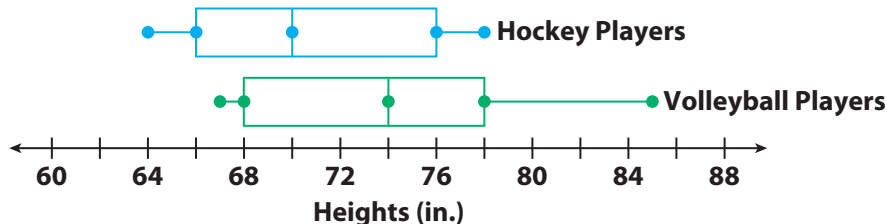
1. Minimum = _____ Maximum = _____

2. Median = _____

3. Range = _____ IQR = _____



For 4–7, use the box plots showing the distribution of the heights of hockey and volleyball players. (*Examples 1 and 2*)



4. Which group has a greater median height? _____
5. Which group has the shortest player? _____
6. Which group has an interquartile range of about 10? _____

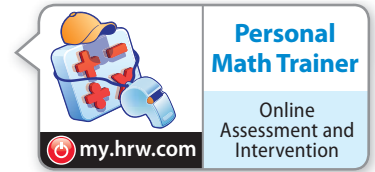


ESSENTIAL QUESTION CHECK-IN

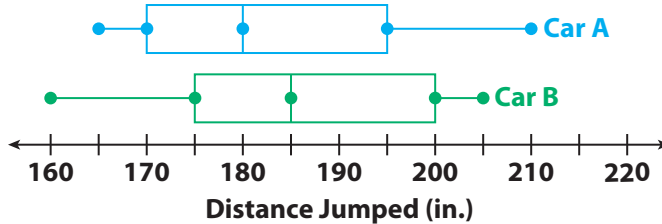
7. What information can you use to compare two box plots?

11.2 Independent Practice

COMMON CORE 7.SP.3, 7.SP.4



For 8–11, use the box plots of the distances traveled by two toy cars that were jumped from a ramp.



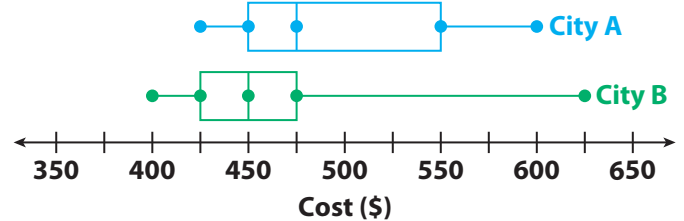
8. Compare the minimum, maximum, and median of the box plots.

9. Compare the ranges and interquartile ranges of the data in box plots.

10. What do the box plots tell you about the jump distances of two cars?

11. **Critical Thinking** What do the whiskers tell you about the two data sets?

For 12–14, use the box plots to compare the costs of leasing cars in two different cities.



12. In which city could you spend the least amount of money to lease a car? The greatest?

13. Which city has a higher median price? How much higher is it?

14. **Make a Conjecture** In which city is it more likely to choose a car at random that leases for less than \$450? Why?

15. Summarize Look back at the box plots for 12–14 on the previous page. What do the box plots tell you about the costs of leasing cars in those two cities?



FOCUS ON HIGHER ORDER THINKING

16. Draw Conclusions Two box plots have the same median and equally long whiskers. If one box plot has a longer box than the other box plot, what does this tell you about the difference between the data sets?

17. Communicate Mathematical Ideas What you can learn about a data set from a box plot? How is this information different from a dot plot?

18. Analyze Relationships In mathematics, *central tendency* is the tendency of data values to cluster around some central value. What does a measure of variability tell you about the central tendency of a set of data? Explain.

Work Area

LESSON 11.3

Using Statistical Measures to Compare Populations

COMMON
CORE

7.SP.3

Informally assess ... two numerical data distributions ... measuring the difference between the centers by expressing it as a multiple of a measure of variability. Also 7.SP.4



ESSENTIAL QUESTION

How can you use statistical measures to compare populations?

Comparing Differences in Centers to Variability

Recall that to find the mean absolute deviation (MAD) of a data set, first find the mean of the data. Next, take the absolute value of the difference between the mean and each data point. Finally, find the mean of those absolute values.



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EXAMPLE 1



COMMON
CORE

7.SP.3

The tables show the number of minutes per day students in a class spend exercising and playing video games. What is the difference of the means as a multiple of the mean absolute deviations?

Minutes Per Day Exercising

0, 7, 7, 18, 20, 38, 33, 24, 22, 18, 11, 6

Minutes Per Day Playing Video Games

13, 18, 19, 30, 32, 46, 50, 34, 36, 30, 23, 19



STEP 1

Calculate the mean number of minutes per day exercising.

$$0 + 7 + 7 + 18 + 20 + 38 + 33 + 24 + 22 + 18 + 11 + 6 = 204$$

$$204 \div 12 = 17 \quad \text{Divide the sum by the number of students.}$$

STEP 2

Calculate the mean absolute deviation for the number of minutes exercising.

$$|0 - 17| = 17 \quad |7 - 17| = 10 \quad |7 - 17| = 10 \quad |18 - 17| = 1$$

$$|20 - 17| = 3 \quad |38 - 17| = 21 \quad |33 - 17| = 16 \quad |24 - 17| = 7$$

$$|22 - 17| = 5 \quad |18 - 17| = 1 \quad |11 - 17| = 6 \quad |6 - 17| = 11$$

Find the mean of the absolute values.

$$17 + 10 + 10 + 1 + 3 + 21 + 16 + 7 + 5 + 1 + 6 + 11 = 108$$

$$108 \div 12 = 9 \quad \text{Divide the sum by the number of students.}$$

STEP 3

Calculate the mean number of minutes per day playing video games. Round to the nearest tenth.

$$13 + 18 + 19 + 30 + 32 + 46 + 50 + 34 + 36 + 30 + 23 + 19 = 350$$

$$350 \div 12 \approx 29.2 \quad \text{Divide the sum by the number of students.}$$

STEP 4

Calculate the mean absolute deviation for the numbers of minutes playing video games.

$$|13 - 29.2| = 16.2 \quad |18 - 29.2| = 11.2 \quad |19 - 29.2| = 10.2$$

$$|30 - 29.2| = 0.8 \quad |32 - 29.2| = 2.8 \quad |46 - 29.2| = 16.8$$

$$|50 - 29.2| = 20.8 \quad |34 - 29.2| = 4.8 \quad |36 - 29.2| = 6.8$$

$$|30 - 29.2| = 0.8 \quad |23 - 29.2| = 6.2 \quad |19 - 29.2| = 10.2$$

Find the mean of the absolute values. Round to the nearest tenth.

$$16.2 + 11.2 + 10.2 + 0.8 + 2.8 + 16.8 + 20.8 + 4.8 + 6.8 + 0.8 + 6.2 + 10.2 = 107.6$$

$$107.6 \div 12 \approx 9 \quad \text{Divide the sum by the number of students.}$$

STEP 5

Find the difference in the means.

$$29.2 - 17 = 12.2 \quad \text{Subtract the lesser mean from the greater mean.}$$

STEP 6

Write the difference of the means as a multiple of the mean absolute deviations, which are similar but not identical.

$$12.2 \div 9 \approx 1.36 \quad \text{Divide the difference of the means by the MAD.}$$

The means of the two data sets differ by about 1.4 times the variability of the two data sets.

YOUR TURN

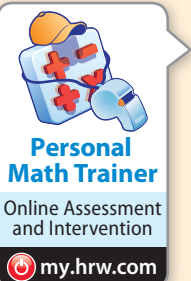
- The high jumps in inches of the students on two intramural track and field teams are shown below. What is the difference of the means as a multiple of the mean absolute deviations?

High Jumps for Students on Team 1 (in.)

44, 47, 67, 89, 55, 76, 85, 80, 87, 69, 47, 58

High Jumps for Students on Team 2 (in.)

40, 32, 52, 75, 65, 70, 72, 61, 54, 43, 29, 32



Using Multiple Samples to Compare Populations

Many different random samples are possible for any given population, and their measures of center can vary. Using multiple samples can give us an idea of how reliable any inferences or predictions we make are.



Math On the Spot

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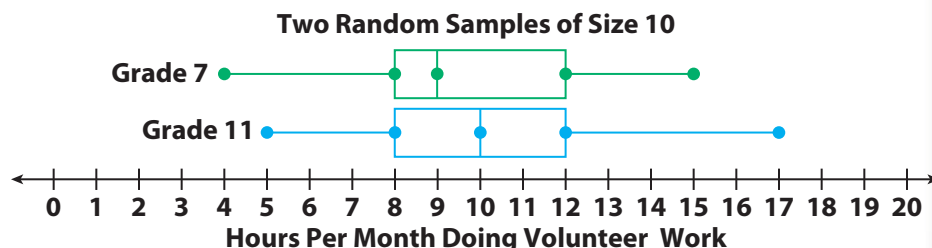
EXAMPLE 2



COMMON
CORE

7.SP.4

A group of about 250 students in grade 7 and about 250 students in grade 11 were asked, "How many hours per month do you volunteer?" Responses from one random sample of 10 students in grade 7 and one random sample of 10 students in grade 11 are summarized in the box plots.



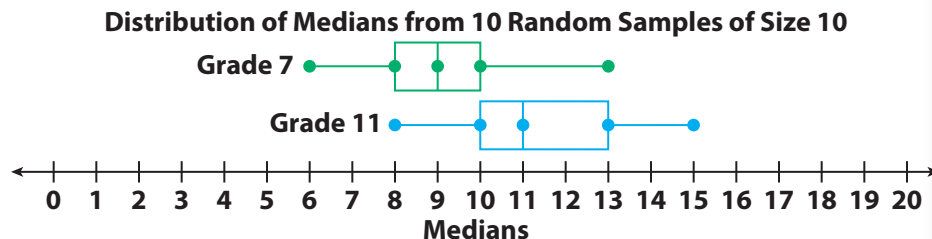
How can we tell if the grade 11 students do more volunteer work than the grade 7 students?

STEP 1

The median is higher for the students in grade 11. But there is a great deal of variation. To make an inference for the entire population, it is helpful to consider how the medians vary among multiple samples.

STEP 2

The box plots below show how the medians from 10 different random samples for each group vary.



The medians vary less than the actual data. Half of the grade 7 medians are within 1 hour of 9. Half of the grade 11 medians are within 1 or 2 hours of 11. Although the distributions overlap, the middle halves of the data barely overlap. This is fairly convincing evidence that the grade 11 students volunteer more than the grade 7 students.

Math Talk

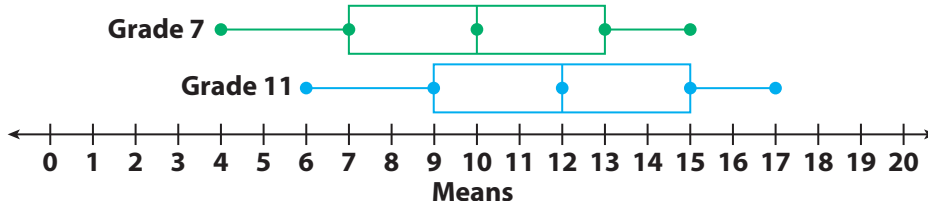
Mathematical Practices

Why doesn't the first box plot establish that students in grade 11 volunteer more than students in grade 7?

YOUR TURN

2. The box plots show the variation in the means for 10 different random samples for the groups in the example. Why do these data give less convincing evidence that the grade 11 students volunteer more?

Distribution of Means from 10 Random Samples of Size 10



Guided Practice

The tables show the numbers of miles run by the students in two classes.

Use the tables in 1–2. (Example 1)

Miles Run by Class 1 Students

12, 1, 6, 10, 1, 2, 3, 10, 3, 8, 3, 9, 8, 6, 8

Miles Run by Class 2 Students

11, 14, 11, 13, 6, 7, 8, 6, 8, 13, 8, 15, 13, 17, 15

- For each class, what is the mean? What is the mean absolute deviation?

- The difference of the means is about _____ times the mean absolute deviations.
- Mark took 10 random samples of 10 students from two schools. He asked how many minutes they spend per day going to and from school. The tables show the medians and the means of the samples. Compare the travel times using distributions of the medians and means. (Example 2)

School A

Medians: 28, 22, 25, 10, 40, 36, 30, 14, 20, 25

Means: 27, 24, 27, 15, 42, 36, 32, 18, 22, 29

School B

Medians: 22, 25, 20, 14, 20, 18, 21, 18, 26, 19

Means: 24, 30, 22, 15, 20, 17, 22, 15, 36, 27

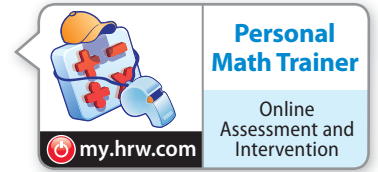


ESSENTIAL QUESTION CHECK-IN

4. Why is it a good idea to use multiple random samples when making comparative inferences about two populations?

11.3 Independent Practice

COMMON CORE 7.SP.3, 7.SP.4



Josie recorded the average monthly temperatures for two cities in the state where she lives. Use the data for 5–7.

Average Monthly Temperatures for City 1 (°F)

23, 38, 39, 48, 55, 56, 71, 86, 57, 53, 43, 31

Average Monthly Temperatures for City 2 (°F)

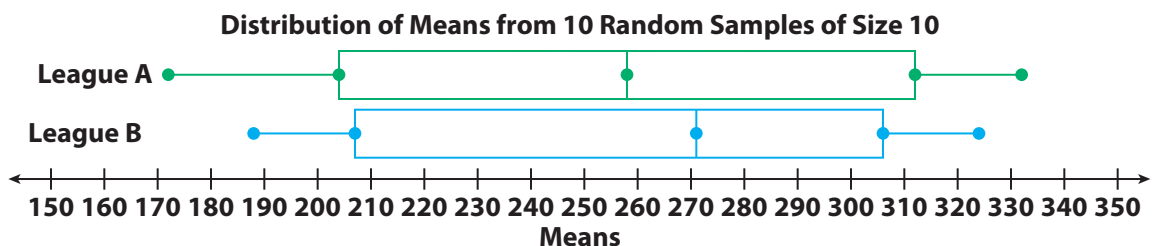
8, 23, 24, 33, 40, 41, 56, 71, 42, 38, 28, 16



5. For City 1, what is the mean of the average monthly temperatures? What is the mean absolute deviation of the average monthly temperatures?

6. What is the difference between each average monthly temperature for City 1 and the corresponding temperature for City 2? _____
7. **Draw Conclusions** Based on your answers to Exercises 5 and 6, what do you think the mean of the average monthly temperatures for City 2 is? What do you think the mean absolute deviation of the average monthly temperatures for City 2 is? Give your answers without actually calculating the mean and the mean absolute deviation. Explain your reasoning.

8. What is the difference in the means as a multiple of the mean absolute deviations? _____
9. **Make a Conjecture** The box plots show the distributions of mean weights of 10 samples of 10 football players from each of two leagues, A and B. What can you say about any comparison of the weights of the two populations? Explain.



- 10. Justify Reasoning** Statistical measures are shown for the ages of middle school and high school teachers in two states.

State A: Mean age of middle school teachers = 38, mean age of high school teachers = 48, mean absolute deviation for both = 6

State B: Mean age of middle school teachers = 42, mean age of high school teachers = 50, mean absolute deviation for both = 4

In which state is the difference in ages between members of the two groups more significant? Support your answer.

- 11. Analyze Relationships** The tables show the heights in inches of all the adult grandchildren of two sets of grandparents, the Smiths and the Thompsons. What is the difference in the medians as a multiple of the ranges?

Heights of the Smiths' Adult Grandchildren (in.)
64, 65, 68, 66, 65, 68, 69, 66, 70, 67

Heights of the Thompsons' Adult Grandchildren (in.)
75, 80, 78, 77, 79, 76, 75, 79, 77, 74



FOCUS ON HIGHER ORDER THINKING

- 12. Critical Thinking** Jill took many samples of 10 tosses of a standard number cube. What might she reasonably expect the median of the medians of the samples to be? Why?
-
-

- 13. Analyze Relationships** Elly and Ramon are both conducting surveys to compare the average numbers of hours per month that men and women spend shopping. Elly plans to take many samples of size 10 from both populations and compare the distributions of both the medians and the means. Ramon will do the same, but will use a sample size of 100. Whose results will probably produce more reliable inferences? Explain.
-
-

- 14. Counterexamples** Seth believes that it is always possible to compare two populations of numerical values by finding the difference in the means of the populations as a multiple of the mean absolute deviations. Describe a situation that explains why Seth is incorrect.
-
-

Work Area

Ready to Go On?



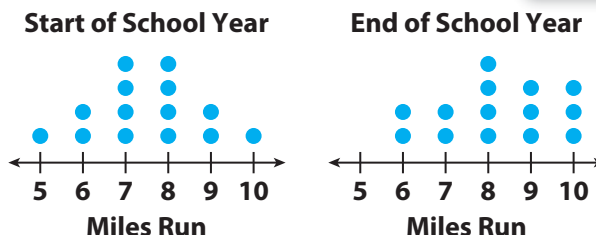
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11.1 Comparing Data Displayed in Dot Plots

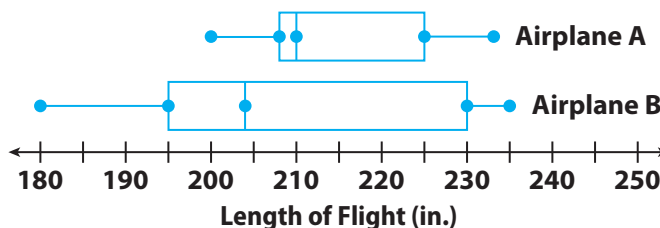
The two dot plots show the number of miles run by 14 students at the start and at the end of the school year. Compare each measure for the two dot plots. Use the data for 1–3.



- means _____
- medians _____
- ranges _____

11.2 Comparing Data Displayed in Box Plots

The box plots show lengths of flights in inches flown by two model airplanes. Use the data for 4–5.



- Which has a greater median flight length? _____
- Which has a greater interquartile range? _____

11.3 Using Statistical Measures to Compare Populations

- Roberta grows pea plants, some in shade and some in sun. She picks 8 plants of each type at random and records the heights.

Shade plant heights (in.)	7	11	11	12	9	12	8	10
Sun plant heights (in.)	21	24	19	19	22	23	24	24

Express the difference in the means as a multiple of their ranges.



ESSENTIAL QUESTION

- How can you use and compare data to solve real-world problems?

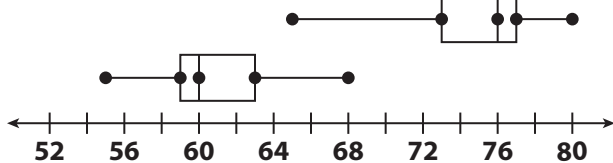


Assessment Readiness



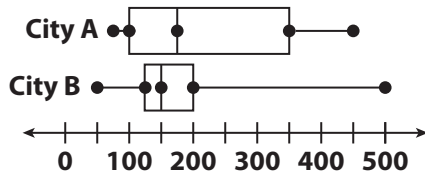
Selected Response

1. Which statement about the data is true?



- (A) The difference between the medians is about 4 times the range.
(B) The difference between the medians is about 4 times the IQR.
(C) The difference between the medians is about 2 times the range.
(D) The difference between the medians is about 2 times the IQR.

2. Which is a true statement based on the box plots below?

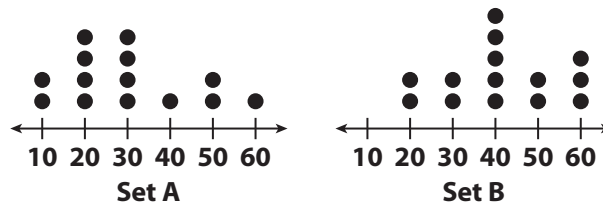


- (A) The data for City A has the greater range.
(B) The data for City B is more symmetric.
(C) The data for City A has the greater interquartile range.
(D) The data for City B has the greater median.

3. What is $-3\frac{1}{2}$ written as a decimal?

- (A) -3.5
(B) -3.05
(C) -0.35
(D) -0.035

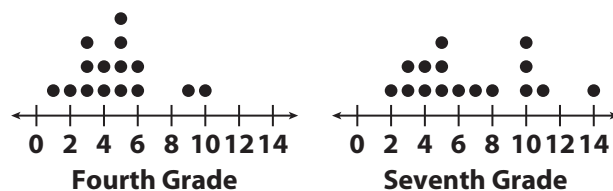
4. Which is a true statement based on the dot plots below?



- (A) Set A has the lesser range.
(B) Set B has the greater median.
(C) Set A has the greater mean.
(D) Set B is less symmetric than Set A.

Mini-Task

5. The dot plots show the lengths of a random sample of words in a fourth-grade book and a seventh-grade book.



- a. Compare the shapes of the plots.

- b. Compare the ranges of the plots. Explain what your answer means in terms of the situation.
