

# Lesson 13

## Shape of Data Distributions

### Main Idea

Describe a data distribution by its center, spread, and overall shape. Relate the choice of center and spread to the shape of the distribution.

### New Vocabulary

**distribution**  
**symmetric**

Math Online

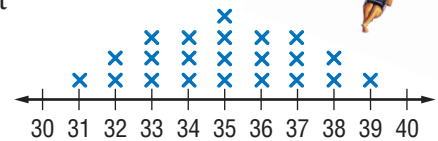
[glencoe.com](http://glencoe.com)

 6.SP.2, 6.SP.5.d

**PARASAILING** The line plot shows the costs in dollars for parasailing for different companies on a certain beach.

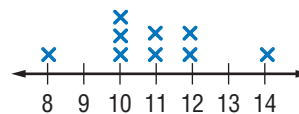


Parasailing Costs (\$)



- Find the measures of central tendency. Round to the nearest tenth if necessary.
- Draw a vertical line through the middle of the data. What do you notice?

The **distribution** of a set of data shows the arrangement of data values. It can be described by its center, spread (variation), and overall shape. If the left side of a distribution looks like the right side, then the distribution is **symmetric**. The distribution below has a *cluster* of several data values within the interval 10–12. The *gaps* 9 and 13 have no data values. The value 10 is a *peak* because it is the most frequently occurring value.



### REAL-WORLD EXAMPLE

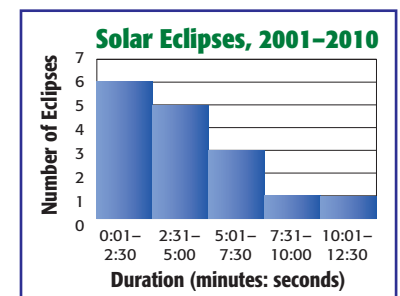
### Describe the Shape of a Distribution

- PARASAILING** Refer to the line plot “Parasailing Costs” above. Use clusters, gaps, peaks, outliers, and symmetry to describe the shape of the distribution.

The left side of the data looks like the right side, so the shape of the distribution is symmetric. There is a cluster from \$31–\$39. The distribution has a peak in the center at \$35. There are no gaps or outliers.

### CHECK Your Progress

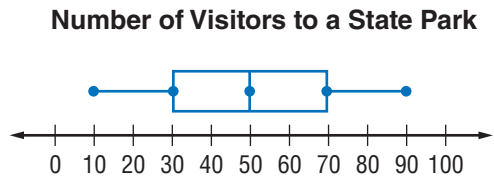
- SOLAR ECLIPSES** Use clusters, gaps, peaks, outliers, and symmetry to describe the shape of the distribution at the right.



While you cannot identify gaps, peaks, and clusters in a box-and-whisker plot, you can still identify symmetry and outliers, as well as describe the shape of a data distribution.

**REAL-WORLD EXAMPLE**

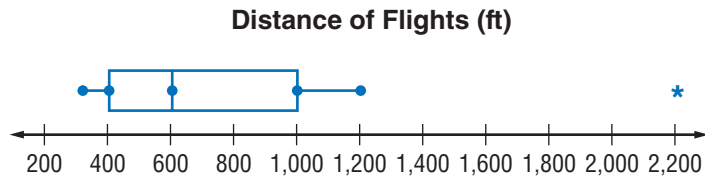
**2 PARKS** The box-and-whisker plot shows the number of visitors to a state park. Describe the shape of the distribution using symmetry and outliers.



Each box and whisker has the same length. So, the data is evenly distributed. The distribution is symmetric since the left side of the data looks like the right side. There are no outliers.

**CHECK Your Progress**

**b. FLIGHTS** The box-and-whisker plot shows the distance of several airplane flights in feet. Describe the shape of the distribution using symmetry and outliers.



You can also describe the center and spread of a data distribution. The shape of the distribution tells you which measures are most appropriate. The mean and mean absolute deviation are affected by outliers, while the median and interquartile range are resistant to outliers. If there is an outlier, the distribution is not symmetric.

**Key Concept** **Measures of Center and Spread**

Use the following flow chart to decide which measures of center and spread are most appropriate to describe a data distribution.

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    graph TD
      Q[Is the data distribution symmetric?] -- Yes --> A[Use the mean to describe the center. Use the mean absolute deviation to describe the spread.]
      Q -- No --> B[Use the median to describe the center. Use the interquartile range to describe the spread.]
  
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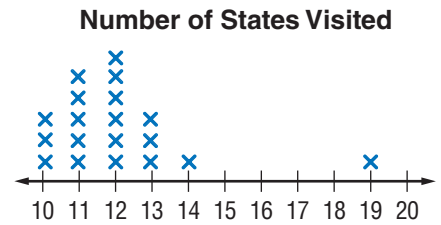


**Real-World Link** . . . . .

In a recent year, California was the state most visited by U.S. travelers. The top three states visited were California, Florida, and Texas.

**REAL-WORLD EXAMPLE**

**3 TRAVEL** The line plot shows the number of states students in Elisa’s social studies class have visited.



a. Choose the appropriate measures to describe the center and spread of the distribution. Justify your response based on the shape of the distribution.

The distribution is *not* symmetric and there is an outlier, 19. The median and interquartile range are appropriate measures to use.

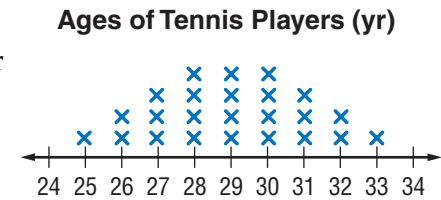
b. Write a few sentences describing the center and spread of the distribution using the appropriate measures.

The median is 12 states. The lower quartile is 11. The upper quartile is 13. The interquartile range is  $13 - 11$ , or 2 states.

The data are centered around 12 states. The spread of the data around the center is about 2 states.

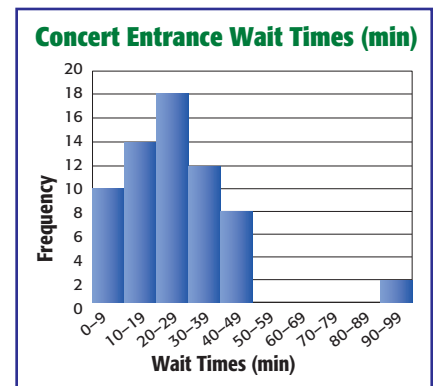
**CHECK Your Progress**

c. **TENNIS** Choose the appropriate measures to describe the center and spread of the distribution. Justify your response based on the shape of the distribution. Then describe the center and spread. Round to the nearest tenth if necessary.

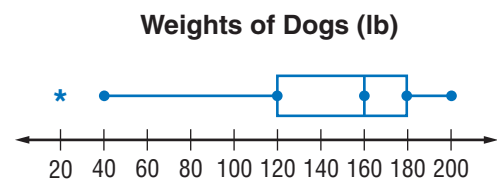


**CHECK Your Understanding**

**Example 1** 1. **CONCERTS** The histogram shows the wait times in minutes for entering a concert. Use clusters, gaps, peaks, outliers, and symmetry to describe the shape of the distribution.

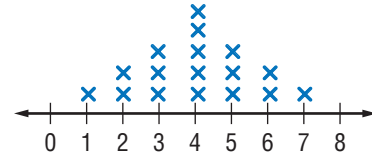


**Example 2** 2. **DOGS** The line plot shows the weights in pounds of several dogs. Describe the shape of the distribution using symmetry and outliers.



**Example 3** 3. **INTERNET** The line plot shows the number of hours several students spent on the Internet during the week.

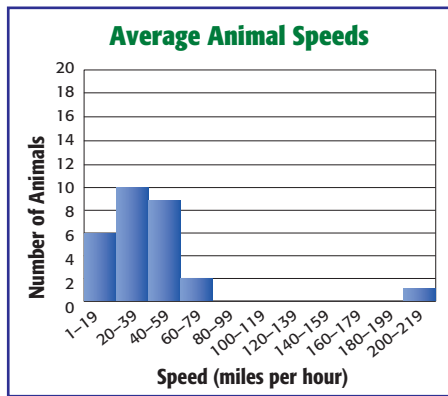
**Number of Hours Spent on the Internet**



- Choose the appropriate measures to describe the center and spread of the distribution. Justify your response based on the shape of the distribution.
- Write a few sentences describing the center and spread of the distribution using the appropriate measures. Round to the nearest tenth if necessary.

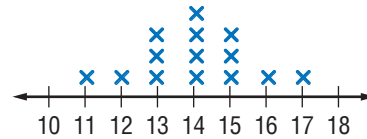
## Practice and Problem Solving

**Example 1** 4. **ANIMALS** The histogram shows the average animal speeds in miles per hour of several animals. Use clusters, gaps, peaks, outliers, and symmetry to describe the shape of the distribution.



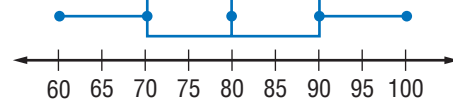
5. **DVDS** The line plot shows the prices in dollars for several DVDs. Use clusters, gaps, peaks, outliers, and symmetry to describe the shape of the distribution.

**DVD Prices (\$)**



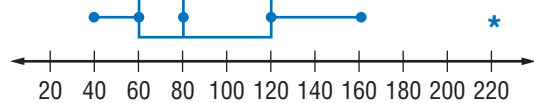
**Example 2** 6. **SCHOOL** The box-and-whisker plot shows the science test scores for Mrs. Everly's students. Describe the shape of the distribution using symmetry and outliers.

**Science Test Scores (%)**



7. **DONATIONS** The box-and-whisker plot shows the donations in dollars to charity by several people. Describe the shape of the distribution using symmetry and outliers.

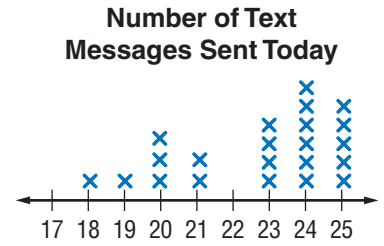
**Donations to Charity (\$)**



**Example 3** • **8. TEXT MESSAGING** The line plot shows the number of text messages sent by different students in one day.



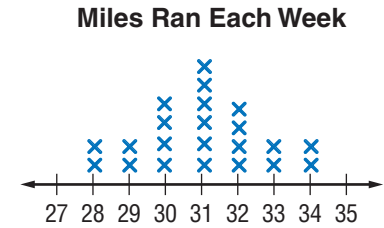
**Real-World Link** . . .  
In a recent year, U.S. teens, ages 13–17, sent and received an average of 58 text messages per day.



a. Choose the appropriate measures to describe the center and spread of the distribution. Justify your response based on the shape of the distribution.

b. Write a few sentences describing the center and spread of the distribution using the appropriate measures.

**9. RUNNING** The line plot shows the number of miles Elisa ran each week.



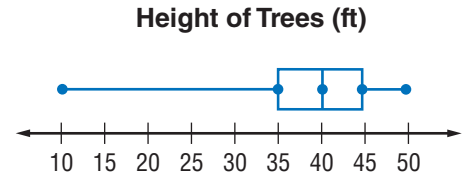
a. Choose the appropriate measures to describe the center and spread of the distribution. Justify your response based on the shape of the distribution.

b. Write a few sentences describing the center and spread of the distribution using the appropriate measures. Round to the nearest tenth if necessary.

**For Exercises 10 and 11, refer to the following information.**

A distribution that is not symmetric is called *skewed*. A distribution that is *skewed left* has fewer data values on the left side than the right side. A distribution that is *skewed right* has fewer data values on the right side than the left side.

**10. TREES** The box-and-whisker plot shows the heights in feet of several trees.

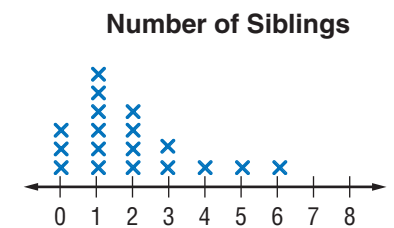


a. Explain how you know the distribution is not symmetric.

b. Is the distribution skewed left or skewed right? Explain.

c. Use appropriate measures to describe the center and spread of the distribution. Justify your choice of measure based on the shape of the distribution.

**11. FAMILY** The line plot shows the number of siblings for 18 students in Jeremiah's homeroom.



a. Explain how you know the distribution is not symmetric.

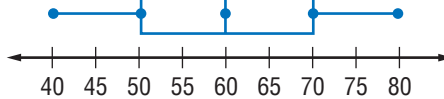
b. Is the distribution skewed left or skewed right? Explain.

c. Use appropriate measures to describe the center and spread of the distribution. Justify your choice of measure based on the shape of the distribution.

## H.O.T. Problems

- 12. OPEN ENDED** Draw a line plot for which the median is the most appropriate measure to describe the center of the distribution.
- 13. CHALLENGE** Explain why you cannot describe the specific location of the center and spread of the box-and-whisker plot shown using the most appropriate measures.

**Calories in Servings of Fruits**



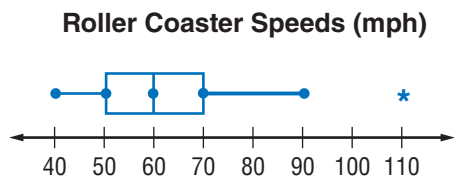
- 14. REASONING** The table gives the average lengths in millimeters of several insects. Without creating a graphical display, describe what the shape of the distribution would look like. Justify your response.

Length of Insects (mm)						
22	30	35	28	15	90	27
32	55	36	24	60	20	30

- 15. WRITE MATH** Explain how the shape of a data distribution tells you which measures are most appropriate to describe the center and spread of the distribution.

### ✓ Test Practice

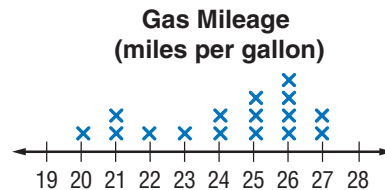
- 16.** Refer to the box-and-whisker plot below.



Which of the following statements is false?

- A. The distribution is symmetric.
- B. The distribution is not symmetric.
- C. The distribution has an outlier.
- D. The distribution has a gap of data.

- 17.** Refer to the line plot below.



Which measure is the most appropriate to describe the variation (spread) of the distribution?

- F. interquartile range
- G. mean
- H. mean absolute deviation
- I. median