English Spanish

7.2 Box-and-Whisker Plots

Essential Question How can you use a box-and-whisker plot to describe a population?

1 ACTIVITY: Drawing a Box-and-Whisker Plot

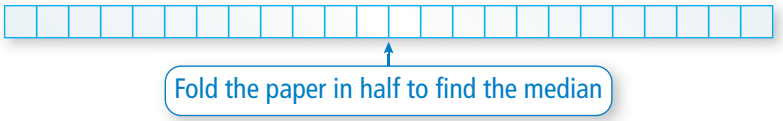
Work with a partner.

The numbers of first cousins of each student in an eighth-grade class are shown.

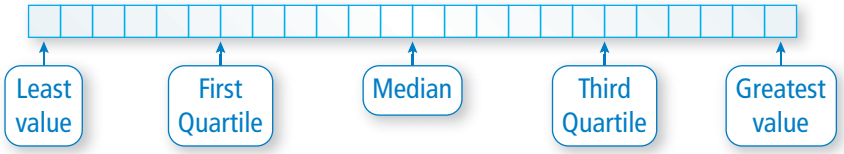
A box-and-whisker plot uses a number line to represent the data visually.

Numbers of First Cousins			
3	10	18	8
9	3	0	32
23	19	13	8
6	3	3	10
12	45	1	5
13	24	16	14

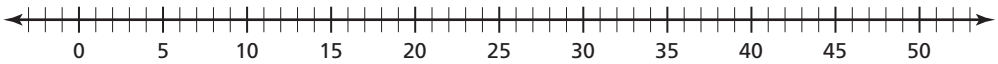
a. Order the data set and write it on a strip of grid paper with 24 equally spaced boxes.



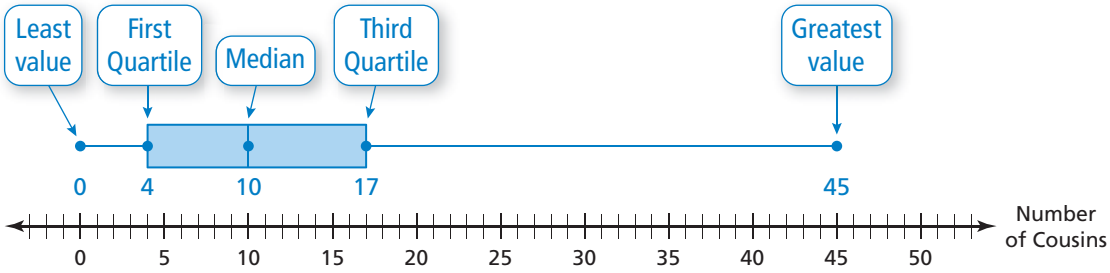
b. Fold the paper in half again to divide the data into four groups. Because there are 24 numbers in the data set, each group should have six numbers.



c. Draw a number line that includes the least value and the greatest value in the data set. Graph the five numbers that you found in part (b).



d. Explain how the box-and-whisker plot shown below represents the data set.



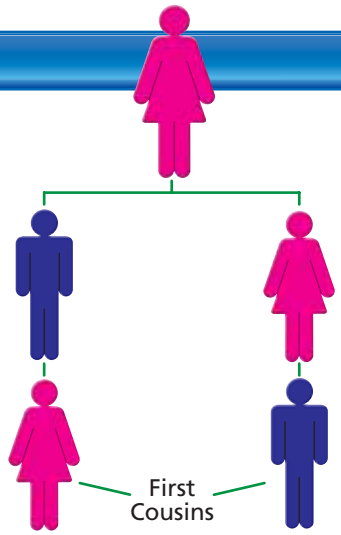
English Spanish

2 ACTIVITY: Conducting a Survey

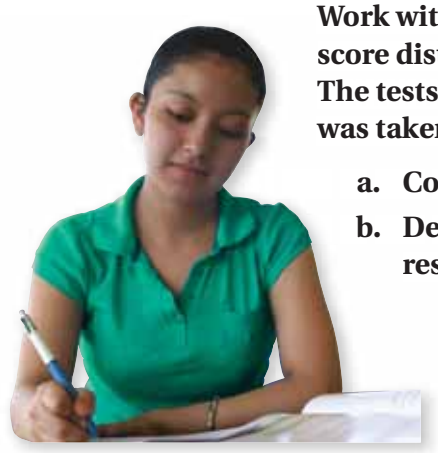
Conduct a survey in your class. Ask each student to write the number of his or her first cousins on a piece of paper. Collect the pieces of paper and write the data on the chalkboard.

Now, work with a partner to draw a box-and-whisker plot of the data.

Two people are first cousins if they share at least one grandparent, but do not share a parent.



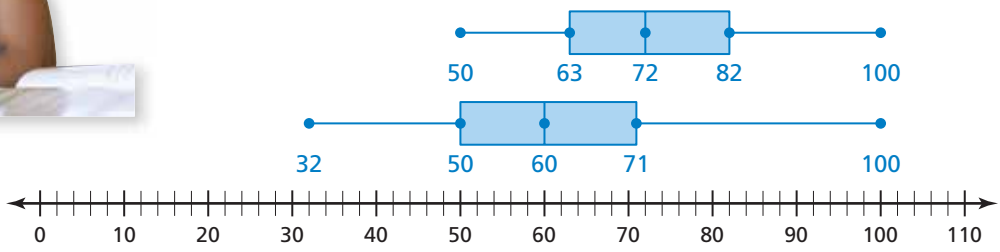
3 ACTIVITY: Reading a Box-and-Whisker Plot



Work with a partner. The box-and-whisker plots show the test score distributions of two eighth-grade standardized tests. The tests were taken by the same group of students. One test was taken in the fall and the other was taken in the spring.

a. Compare and contrast the test results.

b. Decide which box-and-whisker plot represents the results of which test. How did you make your decision?



What Is Your Answer?

4. **IN YOUR OWN WORDS** How can you use a box-and-whisker plot to describe test scores?

5. Describe who might be interested in test score distributions like those shown in Activity 3. Explain why it is important for such people to know test score distributions.

Practice Use what you learned about box-and-whisker plots to complete Exercise 4 on page 284.

English Spanish

7.2 Lesson

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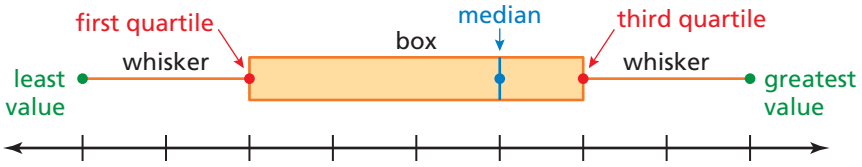
Key Vocabulary
box-and-whisker plot, *p. 282*
quartiles, *p. 282*

Study Tip
A box-and-whisker plot shows the *variability* of a data set.

Key Idea

Box-and-Whisker Plot

A **box-and-whisker plot** displays a data set along a number line using medians. **Quartiles** divide the data set into four equal parts. The median (second quartile) divides the data set into two halves. The median of the lower half is the first quartile. The median of the upper half is the third quartile.

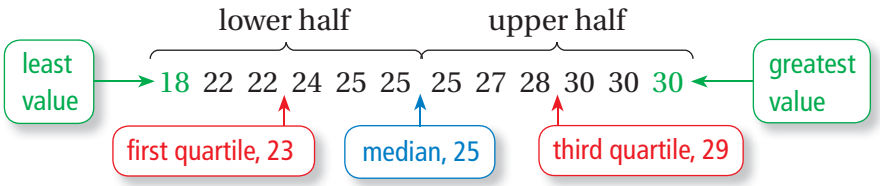


EXAMPLE 1 Making a Box-and-Whisker Plot

Make a box-and-whisker plot for the ages of the members of the 2008 U.S. women's wheelchair basketball team.

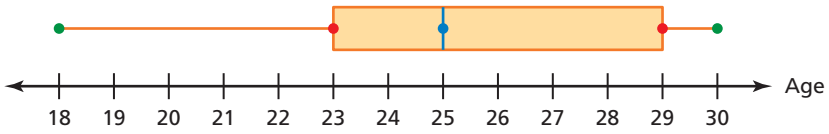
24, 30, 30, 22, 25, 22, 18, 25, 28, 30, 25, 27

Step 1: Order the data. Find the median and the quartiles.



Step 2: Draw a number line that includes the least and greatest values. Graph points above the number line for the least value, greatest value, median, first quartile, and third quartile.

Step 3: Draw a box using the quartiles. Draw a line through the median. Draw whiskers from the box to the least and greatest values.



On Your Own

Now You're Ready
Exercises 5–7

1. A basketball player scores 14, 16, 20, 5, 22, 30, 16, and 28 points during a tournament. Make a box-and-whisker plot for the points scored by the player.

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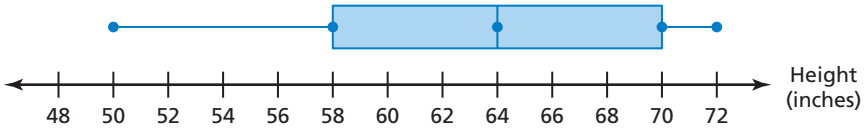
EXAMPLE 2 Interpreting a Box-and-Whisker Plot

What does the box-and-whisker plot tell you about the data?



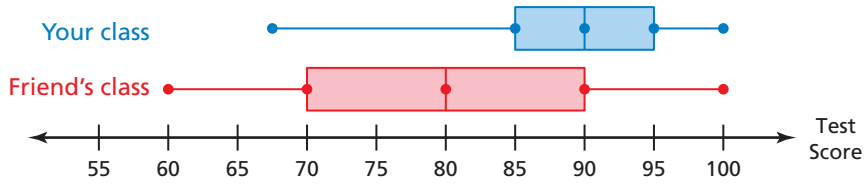
Study Tip

A long whisker or box indicates data is more spread out.

- The left whisker is longer than the right whisker. So, the data are more spread out below the first quartile than above the third quartile.
- The range of the data is $72 - 50 = 22$ inches.

EXAMPLE 3 Standardized Test Practice

Which statement is true about the double box-and-whisker plot?



(A) Half of the test scores in your class are between 85 and 100.

(B) 25% of the test scores in your friend's class are 80 or above.

(C) The medians are the same for both classes.

(D) The test scores in your friend's class are more spread out than the test scores in your class.

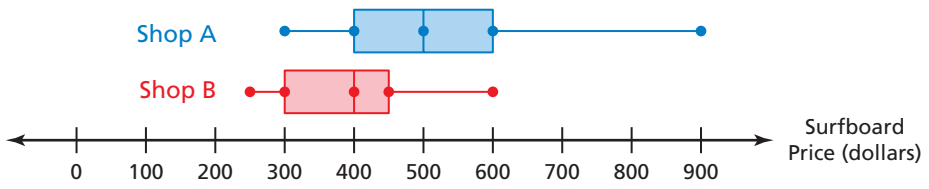
The range of the test scores in your class is less than the range in your friend's class. Also, the box for your friend's class is longer than the box for your class. So, the test scores in your friend's class are more spread out than the test scores in your class.

∴ The correct answer is (D).

On Your Own

Now You're Ready
Exercise 10

2. Compare the surfboard prices of Shop A and Shop B. What are three conclusions you can make from the double box-and-whisker plot?



English Spanish

7.2 Exercises

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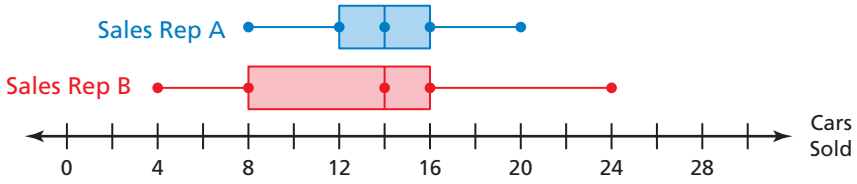
Vocabulary and Concept Check

1. **VOCABULARY** In a box-and-whisker plot, what percent of the data is represented by each whisker? the box?
2. **WRITING** Describe how to find the first quartile of a data set.
3. **NUMBER SENSE** What does the length of the box-and-whisker plot tell you about the data?

Practice and Problem Solving

4. The box-and-whisker plots show the monthly car sales for a year for two sales representatives. Compare and contrast the sales of the two representatives.



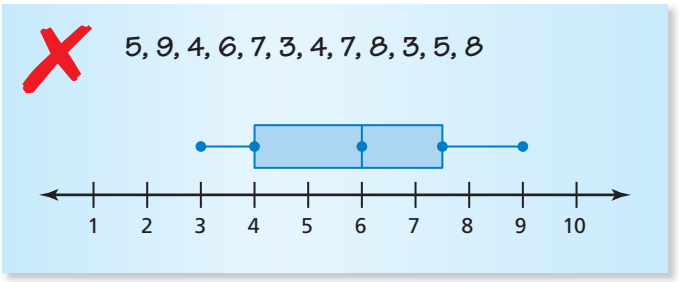
Make a box-and-whisker plot for the data.

1 5. Hours of television watched: 0, 3, 4, 5, 3, 4, 6, 5

6. Lengths (in inches) of cats: 16, 18, 20, 25, 17, 22, 23, 21

7. Elevations (in feet): −2, 0, 5, −4, 1, −3, 2, 0, 2, −3, 6, −1

8. **ERROR ANALYSIS** Describe and correct the error in making a box-and-whisker plot for the data.



9. **FISH** The lengths (in inches) of the fish caught on a fishing trip are 9, 10, 12, 8, 13, 10, 12, 14, 7, 14, 8, and 14. Make a box-and-whisker plot for the data. What is the range of the data?

2 10. **INCHWORM** The table shows the lengths of 12 inchworms. Make a box-and-whisker plot for the data. What does the box-and-whisker plot tell you about the data?

Length (cm)	2.5	2.4	2.3	2.5	2.7	2.1	2.8	2.6	2.1	2.6	2.9	2.0

English Spanish

11. CALORIES The table shows the number of calories burned per hour for nine activities.

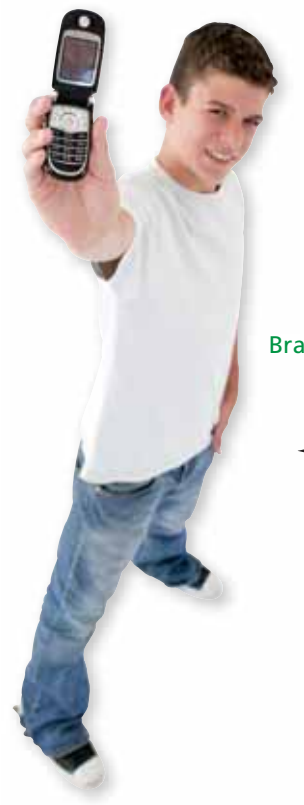
a. Make a box-and-whisker plot for the data.

b. Identify the outlier.

c. Make another box-and-whisker plot without the outlier.

d. WRITING Describe how the outlier affects the whiskers, the box, and the quartiles of the box-and-whisker plot.

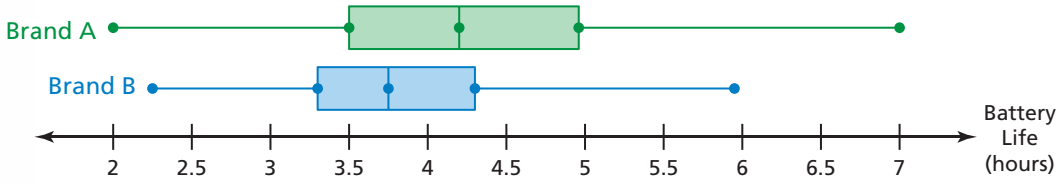
Calories Burned per Hour	
Fishing	207
Mowing the lawn	325
Canoeing	236
Bowling	177
Hunting	295
Fencing	354
Bike racing	944
Horseback riding	236
Dancing	266



12. CELL PHONES The double box-and-whisker plot compares the battery life (in hours) of two brands of cell phones.

a. What is the range of the upper 75% of each brand?

b. Which battery has a longer battery life? Explain.



Critical Thinking **Create a set of data values whose box-and-whisker plot has the given characteristic(s).**

13. The least value, greatest value, quartiles, and median are all equally spaced.

14. Both whiskers are the same length as the box.

15. The box between the median and the first quartile is three times as long as the box between the median and the third quartile.

16. There is no right whisker.

Fair Game Review What you learned in previous grades & lessons

Write an equation of the line that passes through the points. SECTION 3.3

17. $(-4, -10), (2, 8)$

18. $(-3, 3), (0, -1)$

19. $(-4, 1), (4, -1)$

20. $(6, 7), (8, 8)$

21. MULTIPLE CHOICE You run 10 feet per second. What is this rate in miles per hour? SECTION 1.5

(A) 0.11 mi/h (B) 6.82 mi/h (C) 10.23 mi/h (D) 14.67 mi/h