

10.2

Box-and-Whisker Plots

For use with Exploration 10.2

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

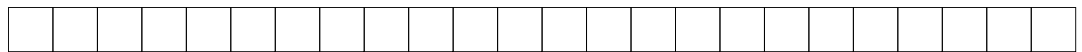
1 EXPLORATION: Drawing a Box-and-Whisker Plot

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. The numbers of first cousins of the students in a ninth-grade class are shown. A *box-and-whisker plot* is one way to represent the data visually.

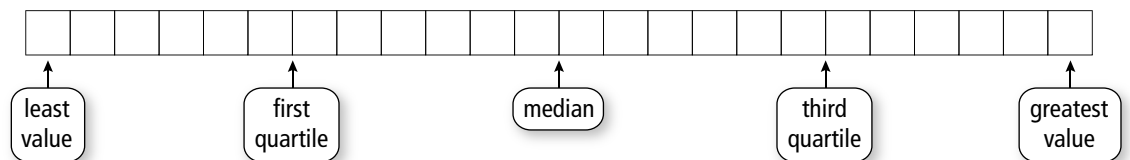
Numbers of First Cousins			
3	10	18	8
9	3	0	32
23	19	13	8
6	3	3	10
12	45	1	5
13	24	16	14

- a. Order the data on a strip of grid paper with 24 equally spaced boxes.



Fold the paper in half to find the median.

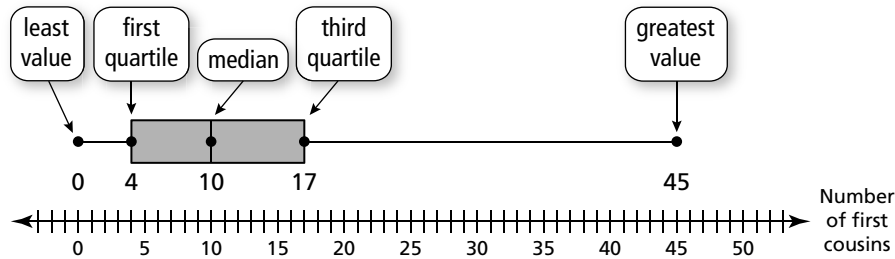
- b. Fold the paper in half again to divide the data into four groups. Because there are 24 numbers in the data set, each group should have 6 numbers. Find the least value, the greatest value, the first quartile, and the third quartile.



10.2 Box-and-Whisker Plots (continued)

1 **EXPLORATION:** Drawing a Box-and-Whisker Plot (continued)

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

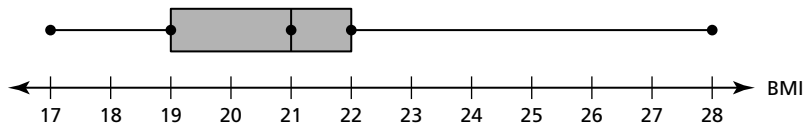


Communicate Your Answer

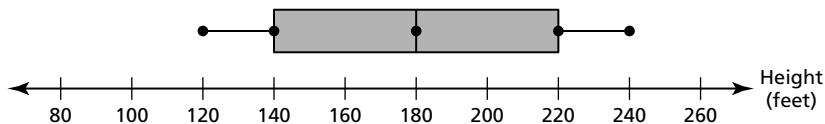
2. How can you use a box-and-whisker plot to describe a data set?

3. Interpret each box-and-whisker plot.

a. body mass indices (BMI) of students in a ninth-grade class



b. heights of roller coasters at an amusement park



10.2

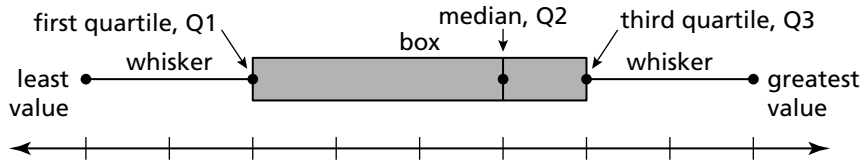
Practice

For use after Lesson 10.2

Core Concepts

Box-and-Whisker Plot

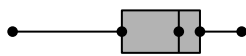
A **box-and-whisker plot** shows the variability of a data set along a number line using the least value, the greatest value, and the *quartiles* of the data. **Quartiles** divide the data set into four equal parts. The median (second quartile, Q2) divides the data set into two halves. The median of the lower half is the first quartile, Q1. The median of the upper half is the third quartile, Q3.



The five numbers that make up a box-and-whisker plot are called the **five-number summary** of the data set.

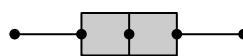
Notes:

Shapes of Box-and-Whisker Plots



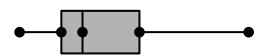
Skewed left

- The left whisker is longer than the right whisker.
- Most of the data are on the right side of the plot.



Symmetric

- The whiskers are about the same length.
- The median is in the middle of the plot.



Skewed right

- The right whisker is longer than the left whisker.
- Most of the data are on the left side of the plot.

Notes:

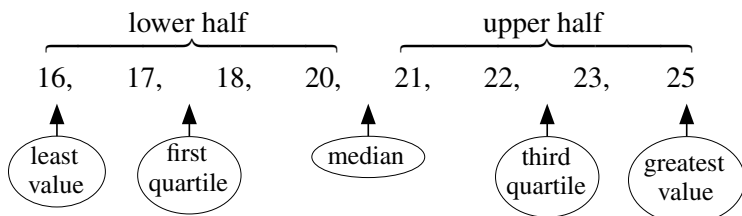
10.2 Practice (continued)

Worked-Out Examples

Example #1

Make a box-and-whisker plot that represents the data.

Cat lengths (in inches): 16, 18, 20, 25, 17, 22, 23, 21



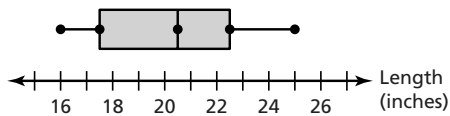
Least value: 16

First quartile: $\frac{17 + 18}{2} = \frac{35}{2} = 17.5$

Median: $\frac{20 + 21}{2} = \frac{41}{2} = 20.5$

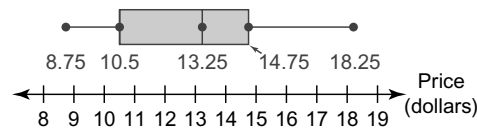
Third quartile: $\frac{22 + 23}{2} = \frac{45}{2} = 22.5$

Greatest value: 25



Example #2

ANALYZING DATA The box-and-whisker plot represents the prices (in dollars) of the entrées at a restaurant.



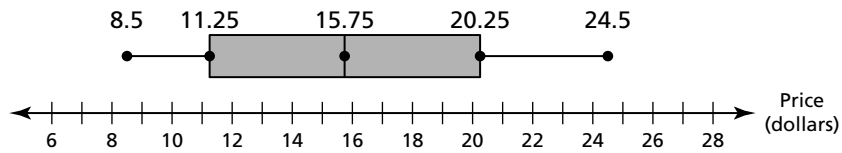
- a. Find and interpret the range of the data.
- b. Describe the distribution of the data.
- c. Find and interpret the interquartile range of the data.
- d. Are the data more spread out below Q1 or above Q3? Explain.
 - a. The range is $18.25 - 8.75 = 9.5$. This means that the prices of the entrées vary by no more than \$9.50.
 - b. 25% of the entrées cost between \$8.75 and \$10.50, 50% of the entrées cost between \$10.50 and \$14.75, and 25% of the entrées cost between \$14.75 and \$18.25.
 - c. The interquartile range is $14.75 - 10.5 = 4.25$. This means that the middle half of the prices vary by no more than \$4.25.
 - d. The right whisker is longer than the left whisker. So, the data above Q3 is more spread out than the data below Q1.

10.2 Practice (continued)

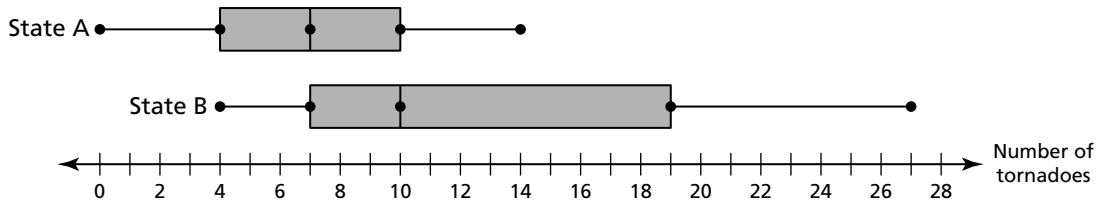
Practice A

In Exercises 1 and 2, make a box-and-whisker plot that represents the data.

1. Hours of sleep: 7, 9, 8, 8, 8, 6, 6, 5, 4
2. Algebra test scores: 71, 92, 84, 76, 88, 96, 84, 63, 82
3. The box-and-whisker plot represents the prices (in dollars) of soccer balls at different sporting goods stores.



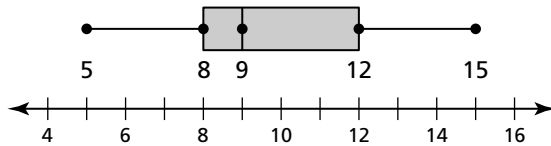
- a. Find and interpret the range of the data.
 - b. Describe the distribution of the data.
 - c. Find and interpret the interquartile range of the data.
 - d. Are the data more spread out below Q1 or above Q3? Explain.
4. The double box-and-whisker plot represents the number of tornadoes per month for a year for two states.



- a. Identify the shape of each distribution.
- b. Which state's tornadoes are more spread out? Explain.
- c. Which state had the single least number of tornadoes in a month during the year? Explain.

Practice B

In Exercises 1–6, use the box-and-whisker plot to find the given measure.



1. least value
2. range
3. first quartile
4. third quartile
5. greatest value
6. median

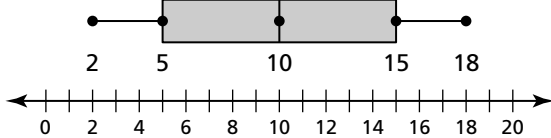
In Exercises 7 and 8, make a box-and-whisker plot that represents the data.

7. Numbers of chairs in a classroom: 30, 27, 32, 25, 12, 22, 20, 29, 35, 35, 28
8. Temperatures (in degrees Fahrenheit): -18 , 0, 7, -8 , -12 , 15, 21, 0, 1, -3
9. The stem-and-leaf plot represents the heights (in inches) of pineapple plants in a garden. Make a box-and-whisker plot that represents the data.

Stem	Leaf
0	4 7 7 8 9
1	0 0 0 2 5 6 9
2	0 1

Key: 1 | 0 = 10 inches

10. The box-and-whisker plot represents a data set. Determine whether each statement is true. Explain your reasoning.



- a. The median of the data is 15.
- b. The distribution is symmetric.