

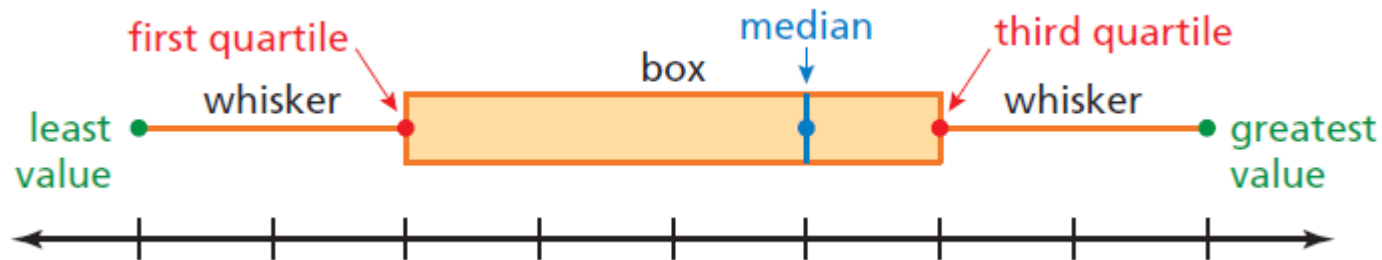
Box-and-Whisker Plots

12.3

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 (2nd quartile) divides the data set into two halves.
- The median of the lower half is the 1st quartile.
- The median of the upper half is the 3rd quartile.



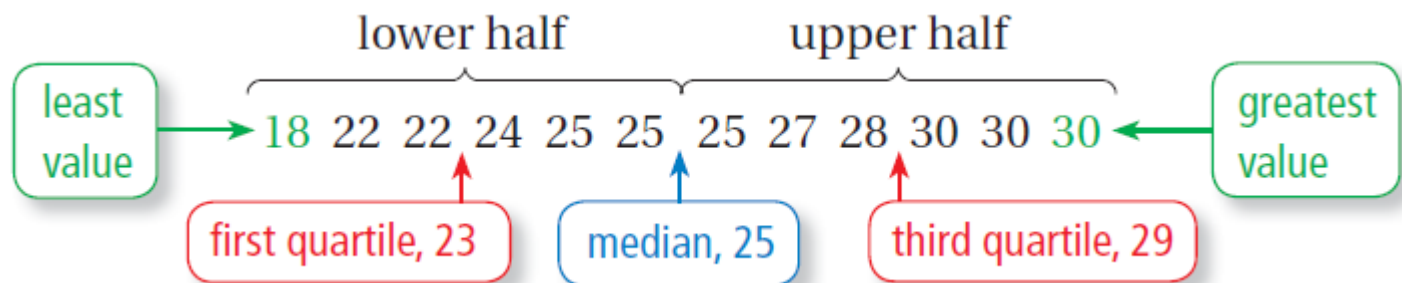
The five numbers that make up the box-and-whisker plot are called the **five number summary** of the data set.

EXAMPLE**1****Making a Box-and-Whisker Plot**

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

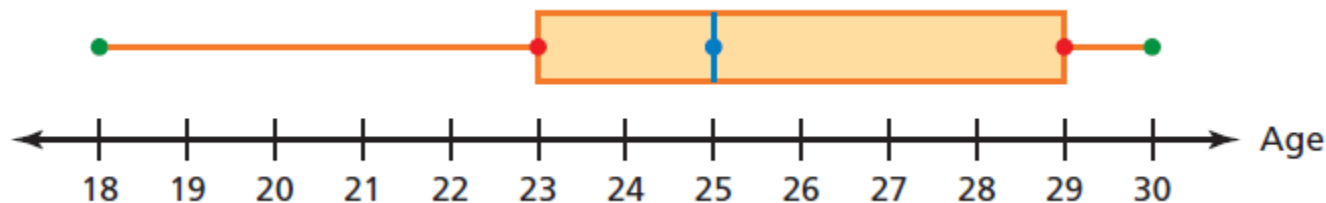
24, 30, 30, 22, 25, 22, 18, 25, 28, 30, 25, 27

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



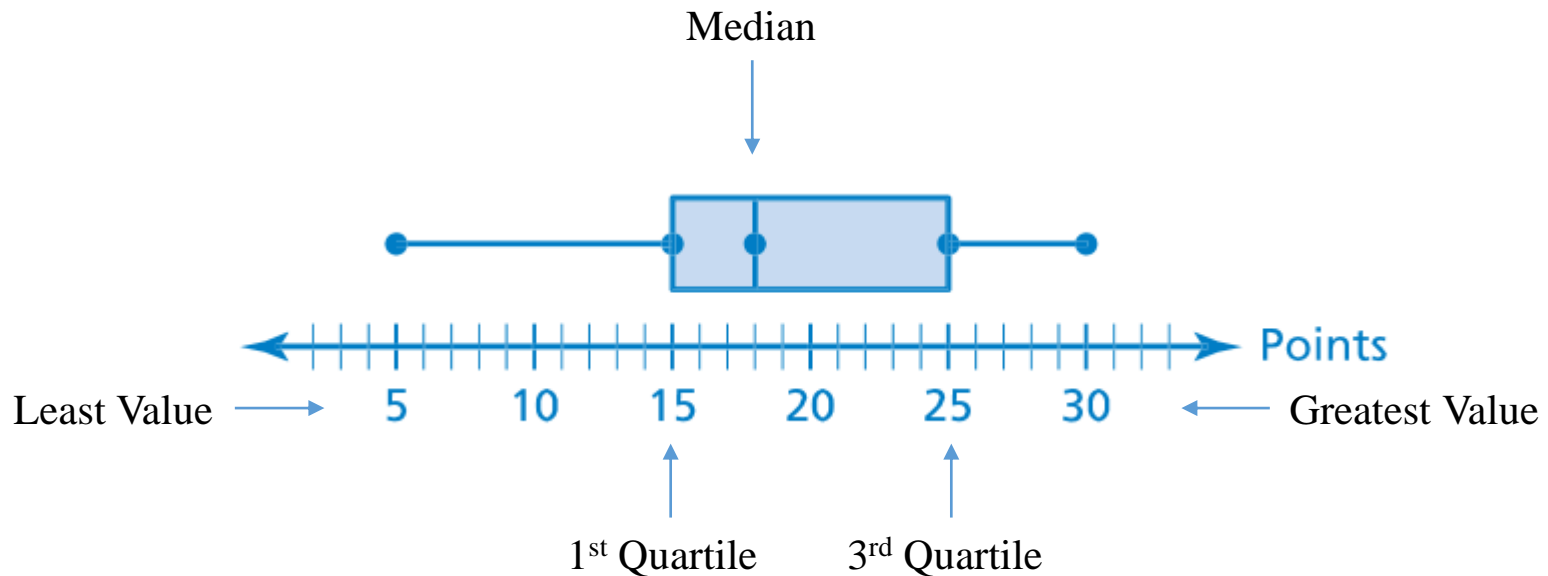
Step 2: Draw a number line that includes the least and greatest values. Graph points above the number line for the five-number summary.

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.

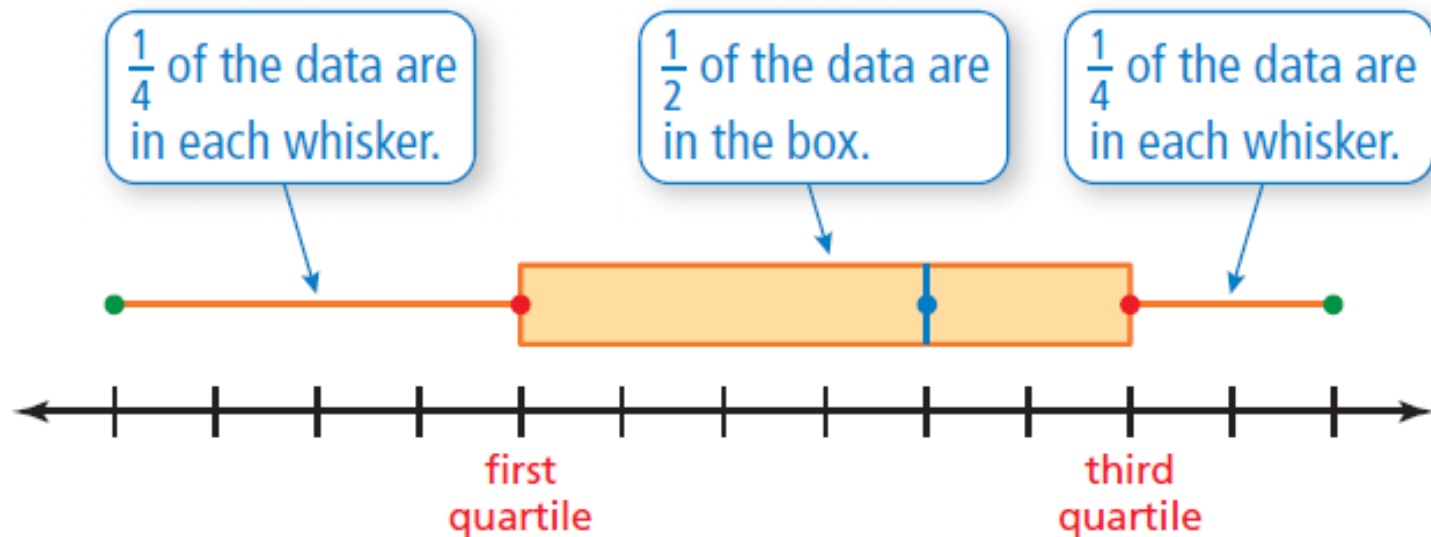


On Your Own

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.



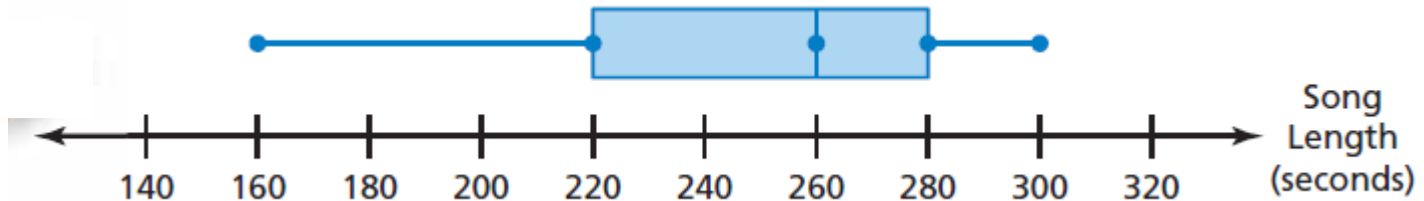
The figure shows how data are distributed in a box-and-whisker plot.



Another measure of dispersion for a data set is the **interquartile range**, which is the difference of the third quartile and the first quartile. It represents the range of the middle half of the data.

EXAMPLE**2****Interpreting a Box-and-Whisker Plot**

The box-and-whisker plot represents the lengths of songs (in seconds) played by a rock band at a concert.



a. Find and interpret the range of the data.

Range: $300 - 160 = 140$. This means that the song lengths vary by no more than 140 seconds.

b. Describe the distribution of the data.

- 25% of the song lengths are between 160 and 220 seconds.
- 50% of the song lengths are between 220 and 280 seconds.
- 25% of the song lengths are between 280 and 300 seconds.

c. Find and interpret the interquartile range of the data.

Interquartile Range: $280 - 220 = 60$. This means that the middle half of song lengths vary by no more than 60 seconds.

On Your Own

Use the box-and-whisker plot in Example 1.

2. Find and interpret the range and interquartile range of the data.

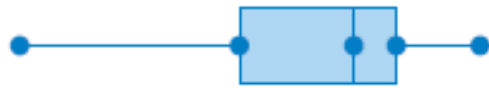
Range: 12 years. This means that ages vary by no more than 12 years. Interquartile Range: 6 years. This means that the middle half of the ages vary by no more than 6 years.

3. Describe the distribution of the data.

25% of the players are between 18 and 23 years old. 50% of the players are between 23 and 29 years old. 25% of the players are between 29 and 30 years old.

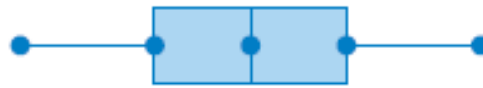
A box-and-whisker plot shows the shape of a distribution.

Shapes of Box-and-Whisker Plots



Skewed left

- Left whisker longer than right whisker
- Most data on the right



Symmetric

- Whiskers about same length
- Median in the middle of the data

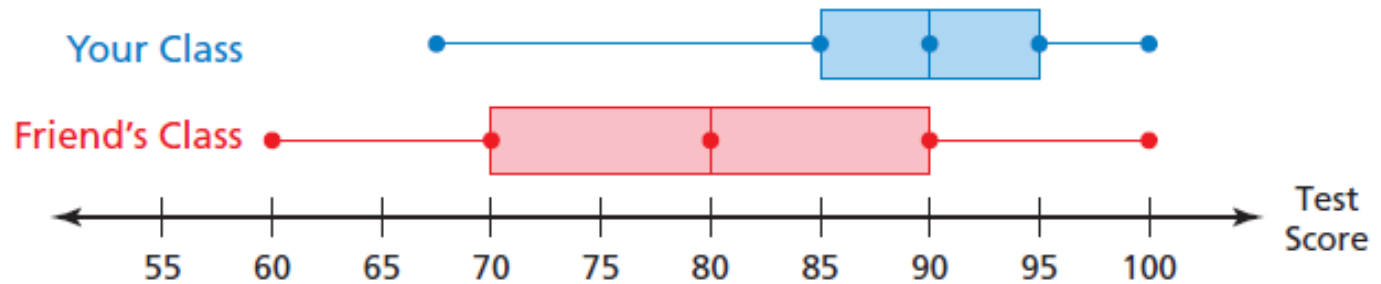


Skewed right

- Right whisker longer than left whisker
- Most data on the left

EXAMPLE**3****Comparing Box-and-Whisker Plots**

The double box-and-whisker plot represents the test scores for your class and your friend's class.



a. Identify the shape of each distribution.

For your class the distribution is skewed left.

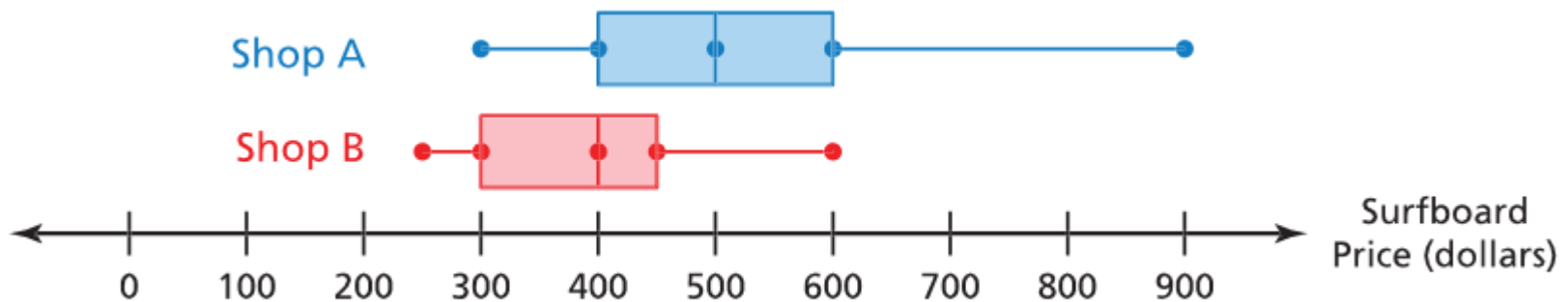
For your friend's class the distribution is symmetric.

b. Which test scores are more spread out?

Because the box in your friend's class is longer than your class, the interquartile range is greater which means the test scores in your friend's class is more spread out.

On Your Own

4. The double box-and-whisker plot represents the surfboard prices at Shop A and Shop B. Identify the shape of each distribution. Which shop's prices are more spread out? Explain.



For both shops, the right whisker is longer than the left whisker and most of the data are on the left side of the display. So, both distributions are skewed right. The range of the prices of Shop A is greater than the range of Shop B. Also, because the box of Shop A is longer than the box for Shop B, the interquartile range is also greater. So, the prices of Shop A are more spread out than the prices of Shop B.