# Notes

**GOAL**
**Make and interpret box-and-whisker plots.**

## Vocabulary

A **box-and-whisker plot** organizes data values into four groups.

Ordered data are divided into lower and upper halves by the median. The median of the lower half is the **lower quartile.** The median of the upper half is the **upper quartile.**

The **interquartile range** of a data set is the difference of the upper quartile and the lower quartile.

A value that is widely separated from the rest of the data in a data set is called an **outlier.**

## Key Concept

Another way of organizing and displaying data is to use a box-and-whisker plot. A box-and-whisker
plot highlights the important statistical values of a data set.

## Common Student Errors

• Finding the mean instead of the median

**Tip** Remind students that you use the median of a data set when creating a box-and-whisker plot.

Sometimes the statistical values used to create a box-and-whisker plot are called the *five-number summary*: (1) minimum, (2) lower quartile, (3) median, (4) upper quartile, and (5) maximum.
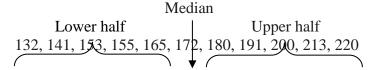
## EXAMPLE 1
## Make a box-and-whisker plot

**Calories** Several brands of ready-to-eat cereals were compared. The number of calories in a serving of dry cereal for each brand is listed below. Make a box-and-whisker plot of the data.

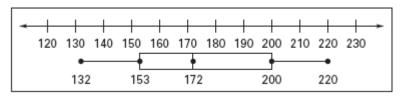153, 172, 213, 141, 155, 220, 165, 180, 132, 200, 191

**Solution**
**STEP 1 Order** the data. Find the median and the quartiles.

Median
Lower half       Upper half
132, 141, 153, 155, 165, 172, 180, 191, 200, 213, 220

Lower quartile       Upper quartile
**STEP 2 Plot** the median, the quartiles, the maximum value, and the minimum value below a number line.

**STEP 3 Draw** a box from the lower quartile to the upper quartile. Draw a vertical line through the median. Draw a line segment (a "whisker") from the box to the maximum and another from the box to the minimum.

## Exercise for Example 1

1. Make a box-and-whisker plot of the heights (in centimeters) of 9 seedling oak trees.
   18, 28, 35, 41, 21, 17, 32, 24, 29

**EXAMPLE 2**
## Interpret a box-and-whisker plot

**Bird count** The box-and-whisker plots show the number of American Goldfinches sighted each month for a year at two different wildlife reserves.



   **a.** For how many months is reserve 2's count at least 17 birds?
   **b.** *Compare* the count in reserve 1 to the count in reserve 2.

**Solution**
   **a.** For reserve 2, the upper half is at least 17 Goldfinches. The median is 17, so for 6 months, reserve 2 has 17 or more Goldfinch sightings each day.
   **b.** The median count for reserve 1 is 25. The median count for reserve 2 is 17. In general, reserve 1 has more Goldfinch sightings than reserve 2.

   For reserve 1, the interquartile range is 27 − 19, or 8 sightings.
   For reserve 2, the interquartile range is 23 − 11, or 12 sightings.
   So, reserve 1 has less variation in the middle 50% of the data. The range for reserve 2 is greater than the range for reserve 1. When all the data are considered, reserve 2 has more variation in Goldfinch sightings.

## Exercises for Example 2

   **2. Bird Count** In Example 2, for how many months was the count lower than 11 at reserve 2?
   **3. Bird Count** In Example 2, for how many months was the count at least 19 at reserve 1?