

Chapter 10

Date:

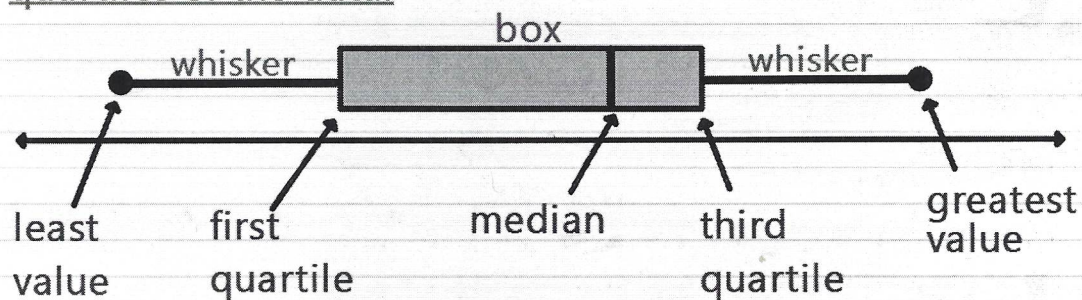
10.4 Box-and-Whisker Plots

Essential Question

How can you use quartiles to represent data graphically?

Key Idea

A box-and-whisker plot represents a data set along a number line by using the least value, the greatest value, and the quartiles of the data.



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

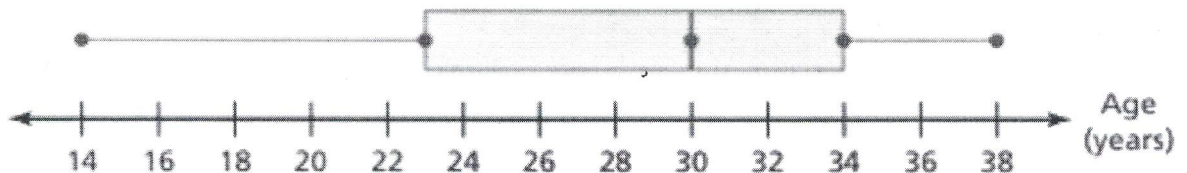
Complete number 1 in your composition book.

- 1) Make a box-and-whisker plot for the ages (in years) of the spider monkeys at a zoo:
15, 20, 14, 38, 30, 36, 30, 30, 27, 26, 33, 35

Step 1: Order the data. Find the median and the 1st and 3rd quartiles.

14, 15, 20, | 26, 27, 30, | 30, 30, 33, | 35, 36, 38
 $Q_1 = 23$ $M = 30$ $Q_3 = 34$

Step 2: Draw a number line that includes the least and greatest values.



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.

Complete number 1 on your notes page.

- 1) The data shows how many hours each friend spent online last night. Make a box-and-whisker plot for the data.

1, 0, 2, 3, 4, 3, 6, 1, 0, 1, 2, 2

Step 1: Order the data. Find the median and the 1st and 3rd quartiles.

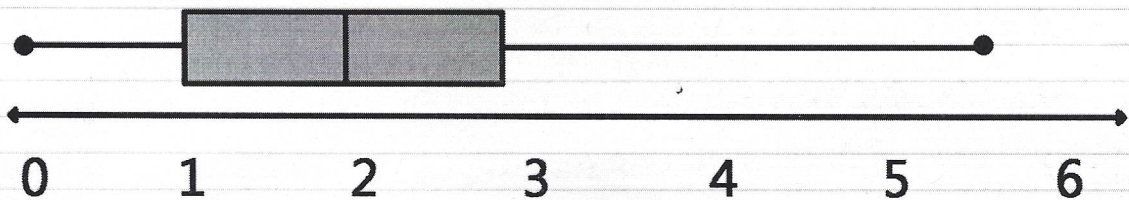
0, 0, 1, | 1, 1, 2, | 2, 2, 3, | 3, 4, 6

$$Q_1 = 1$$

$$M = 2$$

$$Q_3 = 3$$

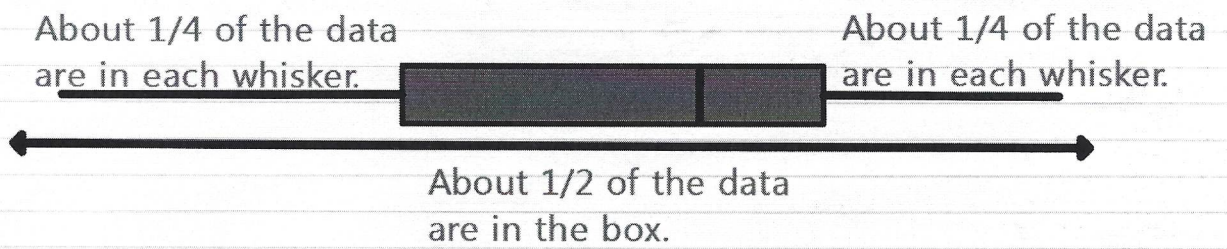
Step 2: Draw a number line that includes the least and greatest values.



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.

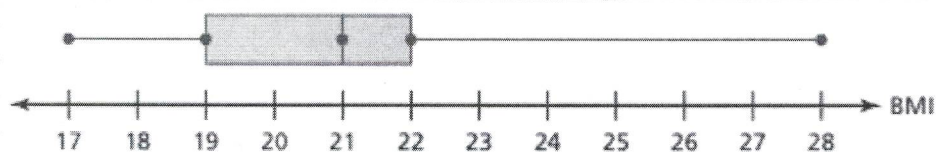
KEY IDEA!

How data is distributed in a box-and-whisker plot:



2) Analyzing a Box-and-Whisker Plot

The box-and-whisker plot shows the body mass index (BMI) of a sixth grade class.



- a. What fraction of the students have a BMI of at least 22?

The right whisker represents students who have a BMI of at least 22 so, about $\frac{1}{4}$ of the students have a BMI of at least 22.

- b. Are the data more spread out below the first quartile or above the third quartile?

The right whisker is longer than the left whisker so, the data are more spread out above the third quartile than below the first quartile.

- c. Find and interpret the interquartile range.

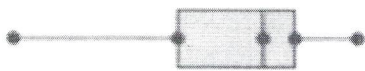
$$\text{IQR} = Q3 - Q1$$

$$\text{IQR} = 22 - 19 = 3$$

The middle half of the students' BMIs varies by no more than 3.

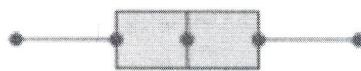
KEY IDEA!

Shapes of Box-and-Whisker Plots



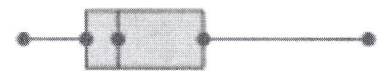
Skewed left

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



Symmetric

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

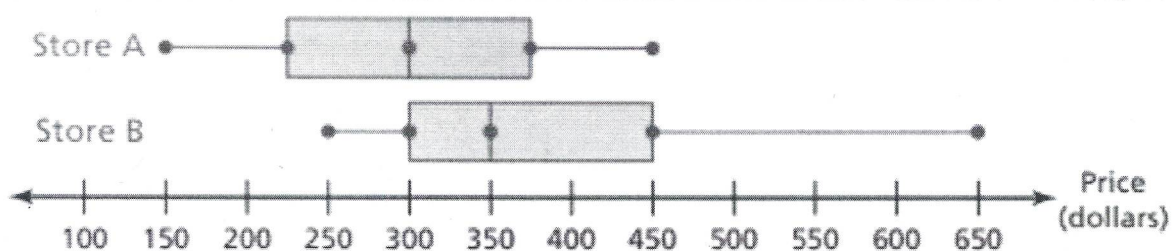


Skewed right

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

3) Comparing Box-and-Whisker Plots

The double box-and-whisker plot represents the prices of snowboards at two stores.



a. Identify the shape of each distribution.

Store A is symmetric because the whisker lengths are equal, the median is in the middle of the box and the data on the left are the mirror image of the data on the right.

Store B is skewed right because the right whisker is longer than the left whisker and most of the data are on the left side of the display.

b. Which store's prices are more spread out? Explain.

The interquartile range are equal because both boxes appear to be the same length. However, the range of the prices in Store B is greater than the range of the prices in Store A, so the prices in Store B are more spread out.