

$$\frac{12.2 + 11 + 19.5 + 13}{4}$$

$$\frac{12.2 + 11 + 13}{3}$$



12.2 lb



11 lb



19.5 lb



13 lb

- Find the mean weight collected. **13.925 lb**
- If the newspapers are not included, find the mean weight rounded to the nearest hundredth. **12.07 lb**
- How does the weight of the newspapers affect the mean?
Sample answer: It causes the mean to be about 2 pounds higher if it is included in the data set.
- What is the median for the data set? How does the median differ if the newspapers are not included?
12.6; Sample answer: The median is 0.4 pounds less if the newspapers are not included.



$$\frac{12.2 + 13}{2}$$

11, 12.2, 13, 19.5

11, 12.2, 13

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Guided Practice



1. The table shows the required temperatures for different recipes. (Examples 1–5)

Cooking Temperature (°F)

175	325	325	350
350	350	400	450

- a. Identify the outlier in the data set. 175°
- b. Determine how the outlier affects the mean, median, and mode of the data. without the outlier: mean: about 364.3°, median: 350°, mode: 350°; with the outlier: mean: about 340.6°, median: 350°, mode: 350°

c. Tell which measure of center best describes the data with and without the outlier. Justify your selection.

The median temperature and mode best describe the data with and without the outlier. The mean temperature is misleading because of the outlier.

2.  **Building on the Essential Question** How does an outlier affect the mean, median, and mode of a data set?

Sample answer: An outlier affects the mean the greatest. It can affect the median some. The outlier does not affect the mode if it was not the mode.

Rate Yourself!

How well do you understand choosing the appropriate measure of center for a data set? Circle the image that

Independent Practice

Go online for Step-by-Step Solutions



- 1** The number of minutes spent studying are: 60, 70, 45, 60, 80, 35, and 45. Find the measure of center that best represents the data. Justify your selection and then find the measure of center. (Examples 1 and 2)

The mean best represents the data. There are no extreme values.

mean: 56.4 minutes

- 2.** The table shows monthly rainfall in inches for five months. Identify the outlier in the data set. Determine how the outlier affects the mean, median, and mode of the data. Then tell which measure of center best describes the data with and without the outlier. Round to the nearest hundredth. Justify your selection. (Examples 3–5)

Month	June	July	Aug	Sept	Oct	Nov
Rainfall (in.)	6.14	7.19	8.63	8.38	6.47	2.43

outlier: 2.43 in.; without the outlier: mean: 7.36 in., median: 7.19 in.,

mode: none; with the outlier: mean: 6.54 in., median: 6.83 in., mode:

none; The mean rainfall best describes the data without the outlier.

The median rainfall best describes the data with the outlier.

3 The table shows the average depth of several lakes.

- a. Identify the outlier in the data set. 1,148
- b. Determine how the outlier affects the mean, median, mode, and range of the data. With the outlier, the mean is 216.83 ft, the median is 33.5 ft, there is no mode, and the range is 1,138. Without the outlier, the mean is 30.6 ft, the median is 24 ft, there is no mode, and the range is 52.
- c. Tell which measure of center best describes the data with and without the outlier. With the outlier, the best measure is the median; without the outlier, the best measure is the mean.

Lake	Depth (ft)
Crater Lake	1,148
East Okoboji	10
Lake Gilead	43
Lake Erie	62
Great Salt Lake	14
Medicine Lake	24

4.  **Construct an Argument** Fill in the graphic organizer below.

Measure of Center	How can an outlier affect it?
mean	The outlier can make the mean significantly greater or less than the mean would be without the outlier.
median	An outlier can change the median slightly or not at all, depending upon the spread of the data.
mode	An outlier that is a single value does not affect the mode.



H.O.T. Problems Higher Order Thinking

5. **CCSS Find the Error** Pilar is determining which measure of center best describes the data set {12, 18, 16, 44, 15, 15}. Find her mistake and correct it.

Pilar did not include the
outlier. The mean is 20.
The median, which is 15.5,
best describes the data
because the outlier affects the
mean more than it affects the median.


$$\frac{12 + 18 + 16 + 15 + 15}{5} = 15.2$$



6. **CCSS Justify Conclusions** Determine whether the following statement is *true* or *false*. If true, explain your reasoning. If false, give a counterexample.


*Of mean, median, and mode, the median will
always be most affected by outliers.*

false; Sample answer: Usually the mean is most affected by an outlier.
In the data set 1, 4, 5, 5, 6, and 24, the mean is 7.5 with the outlier and
4.2 without the outlier.

7.  **Persevere with Problems** Add three data values to the following data set so the mean increases by 10 and the median does not change.

42, 37, 32, 29, 20

Sample answer: 125, 32, and 19

8.  **Model with Mathematics** Use the Internet to find some real-world data. Record your data in the space below. **See students' work.**

- a. Find the mean, median, and mode of your data set.

- b. Are there any outliers? If so, how do they affect the measures of center?

- c. Which measure of center best describes the data with and without the outlier?
