Misleading Graphs & Statistics

Lesson 10.3
1. According to the size of the players, how many times more points does Messier appear to have than Kurri?

*Sample answer: about 2 times as many; Messier's image is twice the height of Kurri's image.*

2. Do you think this is representative of the players’ number of points? Explain.

*Sample answer: No, the graph is misleading. Messier has only about 50 more points than Kurri.*

3. What reason could someone have for intentionally creating a misleading Stanley Cup graph?

*Sample answer: Someone might want the point total for Wayne Gretzky to appear greater than it is actually is.*
1. Explain how the graphs differ.

The graphs show the same data. However, the graphs differ in that Graph A uses an interval of 4, and Graph B uses an interval of 2.

**Changing Scales**

To emphasize a change over time, reduce the scale interval on the vertical axis.
Which graph appears to show a sharper increase in price?

Graph B makes it appear that the prices increased more rapidly even though the price increase is the same.

Which graph might the Student Council use to show that while ticket prices have risen, the increase is not significant? Why?

They might use Graph A. The scale used on the vertical axis of this graph makes the increase appear less significant.
Got It? Do this problem to find out.

The graph at the right shows the results of a survey to determine students’ favorite pets. Why is the graph misleading? (Example 1)

Sample answer: The intervals do not break the scale into equal sections. It appears that there are only 3 more students that voted for cats than dogs, but there are actually 6 more votes.
To determine how often his students are tardy, Mr. Kessler considered the attendance record for his first period class. Why is this graph misleading?

There are not equal intervals on the horizontal axis. So, the height of the bars is not representative of the sample.
The line graphs show monthly profits of a company from October to March. Which graph suggests that the business is extremely profitable? Is this a valid conclusion? Explain.

Sample answer: Graph A shows an exaggerated increase in profits due to intervals of both $500 and $100.
Got It? Do this problem to find out.

**Justify Conclusions** Each of the graphs below show the distance Romerio travels on his bike. Romerio wants to impress his friends with the distance he travels. Which graph should he show his friends? Explain.

**Graph A**

Distance (mi) vs. Time (min)

**Graph B**

Distance (mi) vs. Time (min)
Got It? Do this problem to find out.

**Justify Conclusions** Each of the graphs below show the distance Romerio travels on his bike. Romerio wants to impress his friends with the distance he travels. Which graph should he show his friends? Explain.

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**Sample answer:** Romerio should show his friends Graph A because it shows the increase of the distance better than Graph B. The scale of Graph B makes it hard to determine the change in distance.
**MEASURES OF CENTER**

**Mean:** the sum of the data divided by the number of items in the data set

**Median:** the value at the center (middle) in a set of numerical data when the set is listed least to greatest

**Mode:** the number or numbers that appear most often in a set of data
Measure of Center Practice:

Find the mean, median, and mode in the following set of data:

10, 5, 8, 15, 2, 8, 11, 2

Mean: $\frac{10 + 5 + 8 + 15 + 2 + 8 + 11 + 2}{8} = \frac{61}{8} \approx 7.6$

Median: 2, 2, 5, 8, 8, 10, 11, 15 $\rightarrow$ 8

Mode: 2, 2, 5, 8, 8, 10, 11, 15 $\rightarrow$ 2 and 8
2. An amusement park boasts that the average height of their roller coasters is 170 feet. Explain how this might be misleading.

Mode: none

Median: 109, 115, 126, 135, 365

Mean: $\frac{109 + 135 + 115 + 365 + 126}{5} = \frac{850}{5} = 170$
2. An amusement park boasts that the average height of their roller coasters is 170 feet. Explain how this might be misleading.

<table>
<thead>
<tr>
<th>Park Roller Coaster Heights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaster</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Viper</td>
</tr>
<tr>
<td>Monster</td>
</tr>
<tr>
<td>Red Zip</td>
</tr>
<tr>
<td>Tornado</td>
</tr>
<tr>
<td>Riptide</td>
</tr>
</tbody>
</table>

The average used by the park was the mean. This measure is much greater than most of the heights listed because of the coaster that is 365 feet. So, it is misleading to use this measure to attract visitors.

A more appropriate measure to describe the data is the median, 126 feet, which is closer to the height of most of the coasters.
The table lists the five largest land vehicle tunnels in the United States. Write a convincing argument for which measure of center you would use to emphasize the average length of the tunnels. (Example 2)

**Mode:** none

**Median:**

\[
\begin{align*}
5,920; 6,072; 8,941; 8,959; 13,300 & \rightarrow 8,941 \\
\end{align*}
\]

**Mean:**

\[
\begin{align*}
5,920 + 6,072 + 8,941 + 8,959 + 13,300 &= 43,192 \div 5 \approx 8,638
\end{align*}
\]
The table lists the five largest land vehicle tunnels in the United States. Write a convincing argument for which measure of center you would use to emphasize the average length length of the tunnels. (Example 2)

### U.S. Vehicle Tunnels

<table>
<thead>
<tr>
<th>U.S. Vehicle Tunnels</th>
<th>Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anton Anderson Memorial</td>
<td>13,300</td>
</tr>
<tr>
<td>E. Johnson Memorial</td>
<td>8,959</td>
</tr>
<tr>
<td>Eisenhower Memorial</td>
<td>8,941</td>
</tr>
<tr>
<td>Allegheny</td>
<td>6,072</td>
</tr>
<tr>
<td>Liberty Tubes</td>
<td>5,920</td>
</tr>
</tbody>
</table>

**Mean:** 8,638

**Median:** 8,941

**Mode:** none

**Sample answer:** The mean is 8,638 and the median is 8,941. Since the median is greater than the mean, use the median to emphasize the average length.
Find the mean, median, and mode of the sofa prices shown in the table. Which measurement might be misleading in describing the average cost of a sofa? Explain.

Mean: $1,290

Mode: $1,400

Median: $1,400

The mean would be misleading because the value of the mean is lower than most of the data.

<table>
<thead>
<tr>
<th>Sofa Style</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>leather</td>
<td>$1,700</td>
</tr>
<tr>
<td>reclining</td>
<td>$1,400</td>
</tr>
<tr>
<td>DIY assembly</td>
<td>$350</td>
</tr>
<tr>
<td>sectional</td>
<td>$1,600</td>
</tr>
<tr>
<td>micro-fiber</td>
<td>$1,400</td>
</tr>
</tbody>
</table>
1. Find the mean, median, and mode of the data.

   mean: $560; median: $750; mode: $850

2. Which measure might be misleading in describing the value of each item? Explain.

   The mode because it is significantly higher than the average.

3. Which measure would best describe the value of each item? Explain.

   The mean because it gives an average value for the items.
Find the mean, median, and mode of the data.

Mean: 2,599

Median: 3,190

Mode: None

Which measure of center is misleading in describing the miles of shoreline for the states? Explain.

The mean because all states but one have over 3,000 miles of shoreline. The outlier of 89 causes the mean to be a poor choice to describe the data.

Which measure of center most accurately describes the data? Median
HOMEWORK:

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# 1-9 (all)

# 14-16 (all)