Median, Mode, and Range

HURRICANES The table shows the number of Atlantic hurricanes in different years.

1. Order the data from least to greatest. Which piece of data is in the middle of this list?
2. Compare this number to the mean of the data.

A data set can also be described by its median or its mode. The mean, median, and mode are called measures of central tendency because they describe the center of a set of data.

**Median**

**Words** The median is the middle number of the ordered data when there are an odd number of data, or the mean of the middle two numbers when there are an even number of data.

**Examples**
- data set: 3, 4, 8, 10, 12 → median: 8
- data set: 2, 4, 6, 8, 11, 12 → median: \( \frac{6 + 8}{2} \) or 7

**Mode**

**Words** The mode is the number or numbers that occur most often.

**Example** data set: 12, 23, 28, 28, 32, 46, 46 → modes: 28 and 46

Find the Median and the Mode

MONKEYS The table shows the number of monkeys at eleven different zoos. Find the median and mode of the data.

Order the data from least to greatest.

median: 12, 16, 18, 18, 23, 25, 30, 34, 36, 42, 44

mode: 12, 16, 18, 18, 23, 25, 30, 34, 36, 42, 44

The median is 28 monkeys. The mode is 18 monkeys.

a. BUILDINGS The list shows the number of stories in the 11 tallest buildings in Springfield. Find the median and mode of the data.

40, 38, 40, 37, 33, 30, 20, 24, 21, 17, 19
The **range** of a set of data is the difference between the greatest and the least values of the set. When compared to the values in the data set, a large range indicates that the data are spread out. A small range indicates that the data are close in value.

### Find the Range

**COINS** Ella collected 125, 45, 67, 150, 32, 45, and 12 pennies each day this week for a school fundraiser. Find the range of the data. Then write a sentence that describes how the data vary.

The greatest number of pennies is 150. The least number of pennies is 12. So, the range is 150 – 12 or 138. The range is relatively large, so the data are spread out.

**CHECK Your Progress**

b. **TESTS** Santos’ science test scores this school year were 98, 83, 75, 74, 70, 82, 95, and 88. Find the range of the data. Then write a sentence describing how the data vary.

### Real-World Example

**WEATHER** Find the mean, median, mode, and range of the temperatures displayed in the graph.

- **mean**: 
  \[
  \frac{64 + 70 + 56 + 58 + 60 + 70}{6} = \frac{378}{6} = 63^\circ
  \]
- **median**: 
  \[
  \frac{56, 58, 60, 64, 70, 70}{2} = \frac{124}{2} = 62^\circ
  \]
- **mode**: 70°
- **range**: 70 – 56 = 14°

**CHECK Your Progress**

c. **BACKPACKS** Find the mean, median, mode, and range of the costs in the stem-and-leaf plot.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
<th>Cost of Backpacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0459</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2589</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>89</td>
<td>5</td>
</tr>
</tbody>
</table>
**DESERTS** The table shows the approximate sizes of the world’s largest subtropical deserts. Which statement is supported by the data?

A. Half of the deserts listed are larger than 220,000 square miles.

B. The most common desert size listed is 220,000 square miles.

C. The desert sizes are very spread out.

D. If the total area was divided equally among these deserts, the size of each desert would be about 850,000 square miles.

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### World’s Largest Deserts

<table>
<thead>
<tr>
<th>Desert</th>
<th>Size (square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sahara</td>
<td>3,500,000</td>
</tr>
<tr>
<td>Arabian</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Great Victoria</td>
<td>250,000</td>
</tr>
<tr>
<td>Kalahari</td>
<td>220,000</td>
</tr>
<tr>
<td>Chihuahuan</td>
<td>175,000</td>
</tr>
</tbody>
</table>

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**Real-World Link**

The tallest recorded sand dune in the world is found in the Sahara Desert at 1,410 feet tall. This is just short of the height of the Sears Tower at 1,450 feet.  
**Source:** California Association of 4 Wheel Drive Clubs

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**HOCKEY** The number of goals scored by each player on a high school hockey team is shown. Which statement is supported by the data in the table?

F. If the number of goals were equally distributed among all the players, each player would have scored 3 goals.

G. Half the players scored more than 3 goals, and half scored fewer than 3 goals.

H. Most of the players scored 2 goals.

J. The range is 13 goals.
Find the median, mode, and range for each set of data.

1. Points scored by football team: 15, 20, 23, 13, 17, 21, 17
2. Monthly spending: $46, $62, $63, $57, $50, $42, $56, $40

Find the mean, median, mode, and range of the data represented.

3. Cost of CDs (dollars)

4. Debate Club Membership

5. MULTIPLE CHOICE The lengths of the longest underwater car tunnels are shown. Which statement is supported by the data?
   - A If the lengths of the tunnels were distributed equally among all 5 tunnels, each would measure 8,450 feet in length.
   - B There is no tunnel length that occurs more often than another.
   - C The lengths of the tunnels have a range of 900 feet.
   - D The majority of the tunnels are greater than 8,500 feet in length.

Find the median, mode, and range for each set of data.

6. Age of employees: 23, 22, 15, 36, 44
7. Minutes spent on homework: 18, 20, 22, 11, 19, 18
8. Math test scores: 97, 85, 92, 86
9. Height of trees in feet: 23, 27, 24, 26, 26, 24, 26, 24

ANALYZE DISPLAYS For Exercises 10 and 11, find the mean, median, mode, and range of the data represented.

10. Average Speeds (mph)

11. Test Grades

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
<th>Average</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0 2 2 5 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0 2 5 5 5 5 7 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0 0 2 5 5 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0 0</td>
<td>82%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**ANALYZE DISPLAYS** For Exercises 12 and 13, find the mean, median, mode, and range of the data represented.

12. [Graph of Emilia’s Swimming Schedule]

   - **Day**: 1, 2, 3, 4, 5, 6, 7
   - **Laps Swam**: 0, 2, 16, 14, 12, 8, 6

13. [Graph of Yardwork Jobs]

   - **Month**: 1, 2, 3, 4, 5, 6
   - **Number of Jobs**: 8, 13, 12, 26, 15, 10

14. **MUSIC** Marjorie’s friends bought CDs for $12, $14, $18, $10, $14, $12, $12, and $12. Which measure, mean, median, or mode, best describes the cost of the CDs? Explain your reasoning.

15. **ANALYZE TABLES** A Louisville newspaper claims that during seven days, the high temperature in Lexington was typically 6° warmer than the high temperature in Louisville. What measure was used to make this claim? Justify your answer.

16. **FIND THE DATA** Refer to the Data File on pages 16–19. Choose some data that is best described by its median value. Explain your reasoning.

17. **COLLECT THE DATA** Record the number of students in your math class each day for one week. Then describe the data using the mean, median, and mode.

18. **CHALLENGE** The ticket prices in a concert series were $12, $37, $45, $18, $8, $25, and $18. What was the ticket price of the eighth and final concert in this series if the set of 8 prices had a mean of $23, a mode of $18, a median of $19.50, and a range of $37?

**REASONING** One evening at a local pizzeria, the following number of toppings were ordered on each large pizza.

   3, 0, 1, 1, 2, 5, 4, 3, 1, 0, 0, 1, 1, 2, 2, 3, 6, 4, 3, 2, 0, 2, 1, 3

Determine whether each statement is true or false. Explain your reasoning.

19. The most number of people ordered a pizza with 1 topping.
20. Half the customers ordered pizzas with more than 3 toppings, and half the customers ordered pizzas with less than 3 toppings.
21. **WRITING IN MATH** In the data set {3, 7, 4, 2, 31, 5, 4}, which measure: mean, median, or mode, best describes the set of data? Explain your reasoning.
22. The table shows the number of concerts performed by The Quest. Which statement is supported by the data in the table?

A  Half of the years The Quest performed more than 142 concerts, and half the years they performed fewer than 142 concerts.

B  If the number of concerts were equally distributed among each year, The Quest would have performed 136 concerts each year.

C  The number of concerts performed varies greatly from year to year.

D  The most common number of concerts The Quest performed in one year is 136.

23. SHORT RESPONSE  At the Town Diner, Aiden was deciding on the turkey dinner for $9, the cheeseburger meal for $6, the chicken salad for $5, or the spaghetti with meatballs for $8. What was the range of prices in dollars for the meals he was considering?

24. CELL PHONE  Find the mean number of cell phone minutes Samuel used each month this year.  (Lesson 2-6)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes Used</td>
<td>49</td>
<td>65</td>
<td>20</td>
<td>37</td>
<td>55</td>
<td>68</td>
<td>75</td>
<td>50</td>
<td>24</td>
<td>37</td>
<td>42</td>
<td>30</td>
</tr>
</tbody>
</table>

25. Display the following set of data in a line plot.  (Lesson 2-5)

Number of miles biked: 27, 31, 25, 19, 31, 25, 26, 33, 31

Evaluate each expression if \( x = 3, \ y = 12, \) and \( z = 8. \)  (Lesson 1-5)

26. \( xyz \)

27. \( 2x + z^2 \)

28. \( (2z)^2 + 3x^2 - y \)

**GET READY for the Next Lesson**

**PREREQUISITE SKILL**  For Exercises 29–31, use the graph.  (Lesson 2-2)

29. Which continent has the highest mountain peak?

30. Compare the highest peak in Antarctica to the highest peak in Australia.

31. About how much taller is the highest peak in Asia than the highest peak in Africa?