

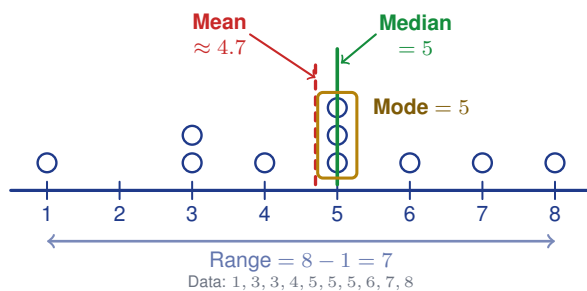
# Mean, Median, Mode, and Range

Name: \_\_\_\_\_

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When you look at a data set, you usually want one number that shows a typical value and another that shows how spread out the data is. The **mean**, **median**, **mode**, and **range** each tell a different part of the story. Sometimes the mean is the best summary, but if there is an outlier, the median might be a better choice. Learning *what* each measure means is just as important as knowing *how* to calculate it!



## Key Concepts & Quick Review

**Mean:**  $\bar{x} = \frac{\text{sum of all values}}{\text{number of values}}$ . **Median:** middle value of ordered data (average of two middle values if even count).

**Mode:** most frequently occurring value (can be none, one, or several).

**Range:**  $\max - \min$ . Use **median** when outliers exist; use **mean** when data is symmetric.

## Examples

① Find the mean, median, mode, and range of: 4, 7, 2, 9, 7, 5, 7, 3.

**Think It Through:** Start by sorting the data: 2, 3, 4, 5, 7, 7, 7, 9. The mean is the total divided by the number of values, so  $44 \div 8 = 5.5$ . Because there are 8 numbers, the median is the average of the two middle values, 5 and 7, which gives 6. The mode is 7 because it appears most often. The range is the largest minus the smallest,  $9 - 2 = 7$ .

**Answer:** Mean = 5.5; Median = 6; Mode = 7; Range = 7

② A realtor reports that the “average” home in a neighbourhood sold for \$380,000. The sales prices were: \$210k, \$220k, \$230k, \$235k, \$900k. Is the mean or median a better measure here? Find both.

**Think It Through:** Find both measures, then decide which one makes more sense. The mean is  $\frac{210+220+230+235+900}{5} = 359$ , so the mean price is about \$359,000. The median is the middle value of the ordered list, which is \$230,000. Because the \$900k sale is much higher than the others, it pulls the mean upward. That makes the median the better measure of a typical home price here.

**Answer:** Mean  $\approx$  \$359k (inflated); median = \$230k (better)






 **Practice Problems**

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

1. For the data set 3, 5, 7, 7, 8, find the mean, median, mode, and range. \_\_\_\_\_
2. For the data set 12, 15, 11, 14, 13, find the mean, median, mode, and range. \_\_\_\_\_
3. For the data set 2, 4, 4, 6, 8, 10, find the mean, median, mode, and range. \_\_\_\_\_
4. For the data set 20, 22, 22, 25, 27, 28, find the mean, median, mode, and range. \_\_\_\_\_
5. For the data set 9, 3, 6, 3, 9, 6, 3, find the mean, median, mode, and range. \_\_\_\_\_
6. For the data set 100, 200, 300, 400, find the mean, median, mode, and range. \_\_\_\_\_
7. For the data set 5, 5, 5, 5, 5, find the mean, median, mode, and range. \_\_\_\_\_
8. For the data set 1, 2, 3, 10, 10, find the mean, median, mode, and range. \_\_\_\_\_
9. For the data set 80, 90, 70, 60, 85, 75, find the mean, median, mode, and range. \_\_\_\_\_
10. For the data set 4, 4, 8, 12, 16, 20, find the mean, median, mode, and range. \_\_\_\_\_
11. For the data set 15, 18, 13, 15, 19, 10, find the mean, median, mode, and range. \_\_\_\_\_
12. For the data set 7, 14, 7, 21, 7, 28, find the mean, median, mode, and range. \_\_\_\_\_
13. The data set 3,  $x$ , 5, 7 has a mean of 5. Find the value of  $x$ . \_\_\_\_\_
14. The ordered data set 2, 4,  $x$ , 8, 10 has a median of 5. Find the value of  $x$ . \_\_\_\_\_
15. The data set 6, 8, 9, 10 gains one new value, 5. Find the new mean. \_\_\_\_\_

**Study Tips**

-  **Always sort the data first** before finding the median — working from an unsorted list is the most common error.
-  If the data has an **outlier** (one extreme value), the median is more reliable than the mean. Outliers pull the mean toward themselves.
-  A data set can have **no mode** (all values different), one mode, or multiple modes (bimodal, trimodal).

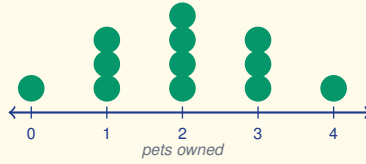
 **Word Problems**

16. A basketball player scores 18, 22, 15, 30, 19, 22, 14, 27 points in eight games. Find the mean, median, mode, and range. In game nine she scores 0 (injured). How does this single score change each of the four statistics? Which measure is most affected? \_\_\_\_\_
17. Seven friends compare their weekly allowances (in dollars): \$10, \$12, \$12, \$15, \$18, \$20, \$85. Find the



mean and median. Which better represents a “typical” allowance? If the friend who gets \$85 is removed from the group, find the new mean. How much does the mean change? \_\_\_\_\_

18. This dot plot records the number of pets each student owns. Use the plot to find the mean, median, mode, and range. \_\_\_\_\_



## Answer Keys

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1) mean 6; med 7; mode 7; range 5</p> <p>2) mean 13; med 13; mode none; range 4</p> <p>3) mean <math>\frac{17}{3}</math>; med 5; mode 4; range 8</p> <p>4) mean 24; med <math>\frac{47}{2}</math>; mode 22; range 8</p> <p>5) mean <math>\frac{39}{7}</math>; med 6; mode 3; range 6</p> <p>6) mean 250; med 250; mode none; range 300</p> <p>7) mean 5; med 5; mode 5; range 0</p> <p>8) mean <math>\frac{26}{5}</math>; med 3; mode 10; range 9</p> <p>9) mean <math>\frac{230}{3}</math>; med <math>\frac{155}{2}</math>; mode none; range 30</p> <p>10) mean <math>\frac{32}{3}</math>; med 10; mode 4; range 16</p> <p>11) mean 15; med 15; mode 15; range 9</p> <p>12) mean 14; med <math>\frac{21}{2}</math>; mode 7; range 21</p> | <p>13) 5</p> <p>14) 6</p> <p>15) 7.6</p> <p>16) Mean 20.875; median 20.5; mode 22; range 16; with 0: mean 18.6, median 19, mode unchanged, range 30; mean most affected</p> <p>17) Mean about \$24.57; median \$15; median more typical; without outlier mean \$14.50; change about \$10.07</p> <p>18) 12 students; mean 2; median 2; mode 2; range 4</p> |
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### Step-by-Step Explanations

**Strategy:** For Volume of Prisms, identify the base shape first, find its area, and multiply by the prism height. A prism-volume setup starts with base area, then stretches that base through the height.

**Practice 1:** A rectangular prism has length 5, width 4, and height 6. Find its volume. **Answer:** 120  
For the first worked item, find the base area, then multiply by the prism height.

**Practice 15:** A rectangular prism has length 2.5, width 3, and height 8. Find its volume. **Answer:** 60  
Near the end of this topic, find the base area, then multiply by the prism height.

#### Word-problem notes:

**16. Answer:** Total:  $90 \times 45 \times 50 = 202,500 \text{ cm}^3$ ; water:  $0.8 \times 202,500 = 162,000 \text{ cm}^3 = 162$  liters.

Start with the full rectangular-prism volume:  $90 \times 45 \times 50 = 202,500 \text{ cm}^3$ . Since the tank is only 80% full, multiply by 0.8 to get the water volume:  $0.8 \times 202,500 = 162,000 \text{ cm}^3$ . Finally, convert cubic centimeters to liters using  $1,000 \text{ cm}^3 = 1$  liter, so the tank holds 162 liters of water.

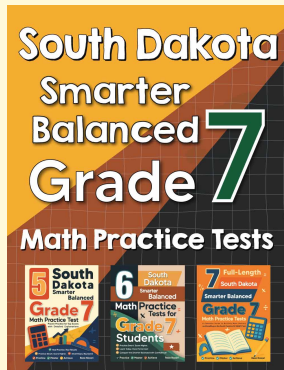
**17. Answer:**  $B = \frac{1}{2}(4)(3.46) = 6.92 \text{ cm}^2$ ;  $V = 6.92 \times 22 \approx 152.2 \text{ cm}^3$ ; mass  $\approx 197.9 \text{ g}$ .

First find the area of the triangular cross-section:  $B = \frac{1}{2}(4)(3.46) = 6.92 \text{ cm}^2$ . Then multiply by the prism length to get the box volume:  $6.92 \times 22 \approx 152.2 \text{ cm}^3$ . If each cubic centimetre of chocolate weighs 1.3 g, multiply the volume by 1.3 to get a total mass of about 197.9 g.



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