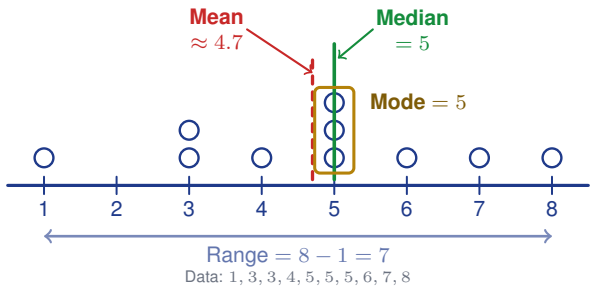
Mean, Median, Mode, and Range

Name: _____	Date: _____	Score: _____ / 18

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: $\bar{x} = \dfrac{\text{sum of all values}}{\text{number of values}}$. **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* $\approx$ \$359*k (inflated); median* $=$ \$230*k (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).

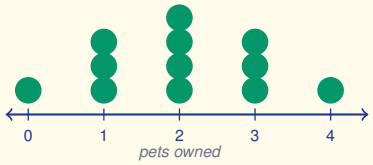
Word Problems

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.



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Answer Keys

1) mean 6; med 7; mode 7; range 5
2) mean 13; med 13; mode none; range 4
3) mean $\frac{17}{3}$; med 5; mode 4; range 8
4) mean 24; med $\frac{47}{2}$; mode 22; range 8
5) mean $\frac{39}{7}$; med 6; mode 3; range 6
6) mean 250; med 250; mode none; range 300
7) mean 5; med 5; mode 5; range 0
8) mean $\frac{26}{5}$; med 3; mode 10; range 9
9) mean $\frac{230}{3}$; med $\frac{155}{2}$; mode none; range 30
10) mean $\frac{32}{3}$; med 10; mode 4; range 16
11) mean 15; med 15; mode 15; range 9
12) mean 14; med $\frac{21}{2}$; mode 7; range 21
13) 5
14) 6
15) 7.6
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
17) Mean about \$24.57; median \$15; median more typical; without outlier mean \$14.50; change about \$10.07
18) 12 students; mean 2; median 2; mode 2; range 4

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

17. Answer: $B = \frac{1}{2}(4)(3.46) = 6.92\ cm^2$; $V = 6.92 \times 22 \approx 152.2\ cm^3$; mass $\approx 197.9\ g$.
First find the area of the triangular cross-section: $B = \frac{1}{2}(4)(3.46) = 6.92\ cm^2$. Then multiply by the prism length to get the box volume: $6.92 \times 22 \approx 152.2\ cm^3$. 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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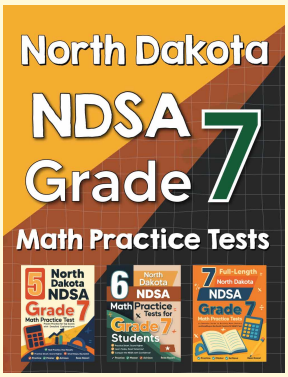

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