Measures of Spread

Name: _____	Date: _____	Score: _____ / 24

Quick Review

Measures of spread tell how spread out the data is. The **range** is the largest value minus the smallest. The **interquartile range (IQR)** is the spread of the middle half: split the ordered data into quarters, find Q_1 (median of the lower half) and Q_3 (median of the upper half), then IQR $= Q_3 - Q_1$. The **mean absolute deviation (MAD)** is the average distance of the values from the mean: find the mean, take each value's distance from it, and average those distances. A bigger spread means the data is more varied.

◇ **Example:** Find the range, IQR, and MAD of $2, 4, 6, 8, 10$.

⇒ The range is easy: $10 - 2 = 8$. For the IQR, the median is the middle value 6. The lower half is $2, 4$ with $Q_1 = 3$, and the upper half is $8, 10$ with $Q_3 = 9$, so IQR $= 9 - 3 = 6$. For the MAD, the mean is $30 \div 5 = 6$. The distances from 6 are $4, 2, 0, 2, 4$, which add to 12, so MAD $= 12 \div 5 = 2.4$.

Answer: range $= 8$, IQR $= 6$, MAD $= 2.4$

PRACTICE

Find the measure of spread asked for in each problem.

1. Range of $12, 8, 15, 20, 5$ _____
2. Range of $40, 55, 30, 60, 45$ _____
3. Range of $7, 7, 7, 7, 7$ _____
4. Range of $3, 9, 1, 14, 8$ _____
5. Range of $100, 75, 50, 25$ _____
6. IQR of $2, 4, 6, 8, 10, 12, 14$ _____
7. IQR of $10, 20, 30, 40, 50, 60, 70$ _____
8. IQR of $1, 3, 5, 7, 9, 11, 13, 15$ _____
9. Mean of $6, 8, 10, 12, 14$ _____
10. MAD of $6, 8, 10, 12, 14$ _____
11. MAD of $1, 2, 3, 4, 5$ _____
12. MAD of $20, 22, 24, 26, 28$ _____
13. MAD of $2, 4, 6, 8$ _____
14. Range of $6, 8, 10, 12, 14$ _____
15. IQR of $6, 8, 10, 12, 14$ _____
16. Range of $1, 2, 3, 4, 5$ _____
17. MAD of $10, 14, 10, 14, 12$ _____
18. IQR of $20, 22, 24, 26, 28$ _____
19. Range of $20, 22, 24, 26, 28$ _____
20. MAD of $5, 15, 5, 15, 10$ _____

♦ Word Problems

21. The weights of five puppies in pounds are $6, 8, 10, 12, 14$. Find the range and the MAD of their weights. _____
22. A scientist recorded plant heights in centimeters: $10, 20, 30, 40, 50, 60, 70$. Find the IQR of the heights. _____
23. Two soccer teams each scored these goals over 5 games. Team A: $2, 3, 3, 3, 4$. Team B: $0, 1, 3, 5, 6$. Both have the same mean of 3. Which team is more consistent? Use the range to explain. _____
24. On a field trip, students' ages were $11, 11, 11, 11, 11, 17$. Find the range, then explain why the MAD would also be small compared with the range. _____

Answer Keys

1. $\boxed{15}$
2. $\boxed{30}$
3. $\boxed{0}$
4. $\boxed{13}$
5. $\boxed{75}$
6. $\boxed{8}$
7. $\boxed{40}$
8. $\boxed{8}$
9. $\boxed{10}$
10. $\boxed{2.4}$
11. $\boxed{1.2}$
12. $\boxed{2.4}$
13. $\boxed{2}$
14. $\boxed{8}$
15. $\boxed{6}$
16. $\boxed{4}$
17. $\boxed{1.6}$
18. $\boxed{6}$
19. $\boxed{8}$
20. $\boxed{4}$
21. $\boxed{\text{range} = 8,\ \ \text{MAD} = 2.4}$
22. $\boxed{40}$
23. $\boxed{\text{Team A (range } 2 < 6)}$
24. $\boxed{\text{range} = 6;\ \text{MAD} = 2}$

Step-by-Step Explanations

1. Largest minus smallest: $20 - 5 = 15$.
2. The biggest is 60, the smallest is 30: $60 - 30 = 30$.
3. All values match, so the range is 0.
4. The largest is 14 and the smallest is 1: $14 - 1 = 13$.
5. Subtract: $100 - 25 = 75$.
6. The median is 8. The lower half $2, 4, 6$ gives $Q_1 = 4$ and the upper half $10, 12, 14$ gives $Q_3 = 12$, so $12 - 4 = 8$.
7. The median is 40. Then $Q_1 = 20$ and $Q_3 = 60$, so the IQR is $60 - 20 = 40$.
8. With 8 values, the lower half is $1, 3, 5, 7$ so $Q_1 = 4$, and the upper half gives $Q_3 = 12$. The IQR is $12 - 4 = 8$.
9. The sum is 50, so the mean is $50 \div 5 = 10$ — a useful first step before finding the MAD.
10. The mean is 10. Distances are $4, 2, 0, 2, 4$, which add to 12, so MAD $= 12 \div 5 = 2.4$.
11. The mean is 3. Distances are $2, 1, 0, 1, 2$, summing to 6, so MAD $= 6 \div 5 = 1.2$.
12. The mean is 24. Distances are $4, 2, 0, 2, 4$, summing to 12, so MAD $= 12 \div 5 = 2.4$.
13. The mean is 5. Distances are $3, 1, 1, 3$, summing to 8, so MAD $= 8 \div 4 = 2$.
14. Largest minus smallest: $14 - 6 = 8$.
15. The median is 10. The lower half $6, 8$ gives $Q_1 = 7$ and the upper half $12, 14$ gives $Q_3 = 13$, so $13 - 7 = 6$.
16. Subtract the smallest from the largest: $5 - 1 = 4$.
17. The mean is $60 \div 5 = 12$. Distances are $2, 2, 2, 2, 0$, summing to 8, so MAD $= 8 \div 5 = 1.6$.
18. The median is 24. Then $Q_1 = 21$ and $Q_3 = 27$, so the IQR is $27 - 21 = 6$.
19. The biggest is 28 and the smallest is 20: $28 - 20 = 8$.
20. The mean is $50 \div 5 = 10$. Distances are $5, 5, 5, 5, 0$, summing to 20, so MAD $= 20 \div 5 = 4$.
21. The range is $14 - 6 = 8$ pounds. The mean is $50 \div 5 = 10$, and the distances from 10 are $4, 2, 0, 2, 4$, which add to 12. So the MAD is $12 \div 5 = 2.4$ pounds.
22. The median is 40. The lower half is $10, 20, 30$ so $Q_1 = 20$, and the upper half is $50, 60, 70$ so $Q_3 = 60$. The IQR is $60 - 20 = 40$ centimeters.
23. Team A's range is $4 - 2 = 2$, while Team B's range is $6 - 0 = 6$. A smaller range means the scores stay closer together, so Team A is more consistent.
24. The range is $17 - 11 = 6$. The mean is $72 \div 6 = 12$, and the distances are $1, 1, 1, 1, 5$, which add to 10, so the MAD is $10 \div 6 \approx 1.7$ — small because most ages sit close to the mean.

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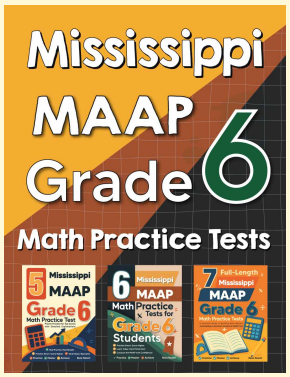

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