

Measures of Spread

Name: _____ Date: _____ Score: _____ / 24

Q 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.

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

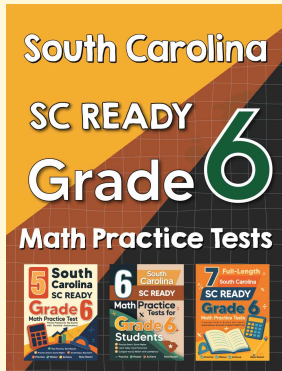
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|--|--|
| <p>1. 15</p> <p>2. 30</p> <p>3. 0</p> <p>4. 13</p> <p>5. 75</p> <p>6. 8</p> <p>7. 40</p> <p>8. 8</p> <p>9. 10</p> <p>10. 2.4</p> <p>11. 1.2</p> <p>12. 2.4</p> | <p>13. 2</p> <p>14. 8</p> <p>15. 6</p> <p>16. 4</p> <p>17. 1.6</p> <p>18. 6</p> <p>19. 8</p> <p>20. 4</p> <p>21. range = 8, MAD = 2.4</p> <p>22. 40</p> <p>23. Team A (range 2 < 6)</p> <p>24. range = 6; MAD = 2</p> |
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Step-by-Step Explanations

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| <p>1. Largest minus smallest: $20 - 5 = 15$.</p> <p>2. The biggest is 60, the smallest is 30: $60 - 30 = 30$.</p> <p>3. All values match, so the range is 0.</p> <p>4. The largest is 14 and the smallest is 1: $14 - 1 = 13$.</p> <p>5. Subtract: $100 - 25 = 75$.</p> <p>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 $12 - 4 = 8$.</p> <p>7. The median is 40. Then $Q_1 = 20$ and $Q_3 = 60$, so the IQR is $60 - 20 = 40$.</p> <p>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 $12 - 4 = 8$.</p> <p>9. The sum is 50, so the mean is $50 \div 5 = 10$ — a useful first step before finding the MAD.</p> <p>10. The mean is 10. Distances are 4, 2, 0, 2, 4, which add to 12, so $MAD = 12 \div 5 = 2.4$.</p> <p>11. The mean is 3. Distances are 2, 1, 0, 1, 2, summing to 6, so $MAD = 6 \div 5 = 1.2$.</p> <p>12. The mean is 24. Distances are 4, 2, 0, 2, 4, summing to 12, so $MAD = 12 \div 5 = 2.4$.</p> <p>13. The mean is 5. Distances are 3, 1, 1, 3, summing to 8, so $MAD = 8 \div 4 = 2$.</p> | <p>14. Largest minus smallest: $14 - 6 = 8$.</p> <p>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 $13 - 7 = 6$.</p> <p>16. Subtract the smallest from the largest: $5 - 1 = 4$.</p> <p>17. The mean is $60 \div 5 = 12$. Distances are 2, 2, 2, 2, 0, summing to 8, so $MAD = 8 \div 5 = 1.6$.</p> <p>18. The median is 24. Then $Q_1 = 21$ and $Q_3 = 27$, so the IQR is $27 - 21 = 6$.</p> <p>19. The biggest is 28 and the smallest is 20: $28 - 20 = 8$.</p> <p>20. The mean is $50 \div 5 = 10$. Distances are 5, 5, 5, 5, 0, summing to 20, so $MAD = 20 \div 5 = 4$.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> |
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