Measures of Spread

Measures of spread: Models and calculations

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QUICK REVIEW

Range = maximum − minimum. IQR = $Q_3 - Q_1$ describes the middle half. Split sorted data into two halves; for an odd count omit the overall median from both halves. MAD averages absolute distances from the mean. For $2, 4, 6, 8$, range $= 6$, $Q_1 = 3, Q_3 = 7$, IQR $= 4$, mean $= 5$, MAD $= (3 + 1 + 1 + 3)/4 = 2$.

Worked example

Find mean absolute deviation. Data: $2, 4, 6, 8$.

1. Mean $= 20/4 = 5$.
2. Absolute distances from 5: $3, 1, 1, 3$; their sum is 8.
3. MAD $= 8/4 = 2$ units.
Answer: MAD $= 2$ units.

Practice Problems

Show your thinking.

1. Find the full spread. Data: $1, 3, 5, 7, 9$.

2. Find the middle-half spread. Data: $2, 4, 6, 8, 10, 12$.

3. Find average distance from the mean. Data: $2, 4, 4, 6$.

4. Explain what no variability means numerically. Data: $5, 5, 5, 5$.

5. Find IQR of trip times in minutes. Data: $10, 12, 14, 16, 18, 20$.

6. A student reports maximum 9 as range. Correct it. Data: $3, 4, 6, 9$.

Answer Key

1. Range $= 8$ units.
2. IQR $= 6$ units.
3. MAD $= 1$ unit.
4. MAD $= 0$ units.
5. IQR $= 6$ minutes.
6. Range $= 6$ units.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Minimum 1 and maximum 9 are the endpoints.
2. Range $= 9 - 1 = 8$ units.

Problem 2

1. Lower half $2, 4, 6$ has median $Q_1 = 4$; upper half $8, 10, 12$ has median $Q_3 = 10$.
2. IQR $= Q_3 - Q_1 = 10 - 4 = 6$ units.

Problem 3

1. Mean $= 16/4 = 4$.
2. Absolute distances from 4: $2, 0, 0, 2$; their sum is 4.
3. MAD $= 4/4 = 1$ unit.

Problem 4

1. Mean $= 20/4 = 5$.
2. Absolute distances from 5: $0, 0, 0, 0$; their sum is 0.
3. MAD $= 0/4 = 0$ units.

Problem 5

1. Lower half $10, 12, 14$ has median $Q_1 = 12$; upper half $16, 18, 20$ has median $Q_3 = 18$.
2. IQR $= Q_3 - Q_1 = 18 - 12 = 6$ minutes.

Problem 6

1. Minimum 3 and maximum 9 are the endpoints.
2. Range $= 9 - 3 = 6$ units.

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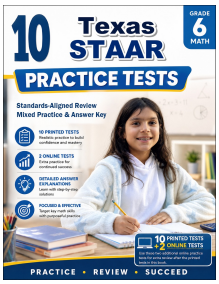

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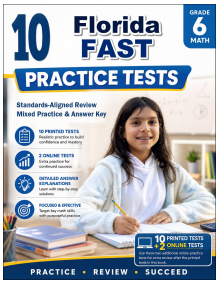

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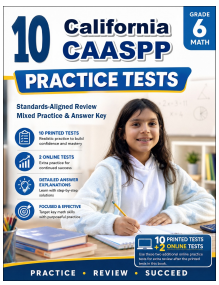

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