Measures of Spread

Measures of spread: Applications and decisions

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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 mean absolute deviation of the fill amounts, in mL. Data: $6, 8, 10, 12$.

2. Find the spread of the middle half of run times, in seconds. Data: $12, 14, 16, 18, 20, 22$.

3. Find the full spread of rainfall readings, in mm. Data: $4, 7, 9, 13$.

4. Find average distance from a machine mean output, in grams. Data: $9, 9, 11, 11$.

5. Recover quartiles for a reading-time report and find IQR, in minutes. Data: $2, 4, 6, 8, 10, 12, 14, 16$.

6. A report calls the count 4 the range of delivery times. Correct it, in minutes. Data: $5, 6, 7, 20$.

Answer Key

1. MAD $= 2$ mL.
2. IQR $= 6$ seconds.
3. Range $= 9$ mm.
4. MAD $= 1$ gram.
5. $Q_1 = 5, Q_3 = 13$ minutes; IQR 8 minutes.
6. Range $= 15$ minutes.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Mean $= 36/4 = 9$.
2. Absolute distances from 9: $3, 1, 1, 3$; their sum is 8.
3. MAD $= 8/4 = 2$ mL.

Problem 2

1. Lower half $12, 14, 16$ has median $Q_1 = 14$; upper half $18, 20, 22$ has median $Q_3 = 20$.
2. IQR $= Q_3 - Q_1 = 20 - 14 = 6$ seconds.

Problem 3

1. Minimum 4 and maximum 13 are the endpoints.
2. Range $= 13 - 4 = 9$ mm.

Problem 4

1. Mean $= 40/4 = 10$.
2. Absolute distances from 10: $1, 1, 1, 1$; their sum is 4.
3. MAD $= 4/4 = 1$ gram.

Problem 5

1. Lower half $2, 4, 6, 8$ has median $Q_1 = 5$; upper half $10, 12, 14, 16$ has median $Q_3 = 13$.
2. IQR $= Q_3 - Q_1 = 13 - 5 = 8$ minutes.

Problem 6

1. Minimum 5 and maximum 20 are the endpoints.
2. Range $= 20 - 5 = 15$ minutes.

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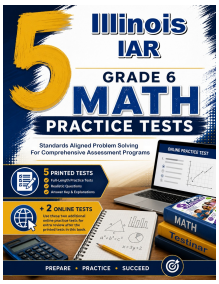

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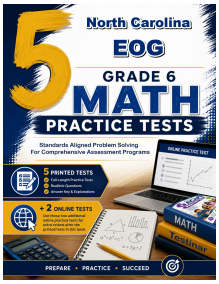

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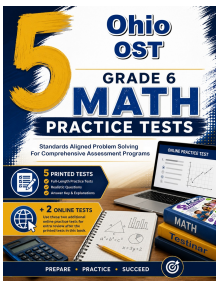

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