# Mean Absolute Deviation

Calculate, complete, and compare data sets

**Name** _____ **Date** _____ **Score** _____ / 10

**QUICK REVIEW**

The mean absolute deviation (MAD) describes the average distance from the mean. First find $\bar{x} = \frac{\text{sum}}{n}$. Find each nonnegative distance $|x - \bar{x}|$. Then divide the sum of those distances by $n$, not $n - 1$. A larger MAD means more spread. Give exact answers.

**Worked example**

Find the MAD of $2, 4, 6, 8$.

**1.** Mean: $\bar{x} = \frac{20}{4} = 5$.
**2.** Compute $|x - 5|$ for each value: $3, 1, 1, 3$. Their sum is $8$.
**3.** MAD $= \frac{8}{4} = 2$.
**Answer:** $2$

## Practice Problems

Show your thinking.

**1.** Find the mean and MAD of $2, 4, 4, 6$.

**2.** Find the MAD of $1, 3, 5, 7$.

**3.** The mean of $4, 6, 6, 8$ is $6$. List the absolute deviations, then find the MAD.

**4.** Find the MAD of $0, 3, 3, 6$. Include the zero distances.

**5.** The four absolute deviations from a mean are $1, 1, 3, 3$. Find the MAD.

**6.** Find the MAD of $7, 7, 7, 7$ and explain what it means.

**7.** Find the mean and MAD of $2, 2, 8, 8$.

**8.** Find each MAD. Which set is more consistent? A: $2, 3, 4$. B: $0, 3, 6$.

**9.** Find the MAD of $5, 5, 9, 9$. Do repeated values count separately?

**10.** A data set has mean $12$ and MAD $0$. Give four possible values.

# Answer Key

1. Mean $4$; MAD $1$.
2. $2$
3. Distances $2, 0, 0, 2$; MAD $1$.
4. $\frac{3}{2}$
5. $2$
6. MAD $0$; all values equal the mean.
7. Mean $5$; MAD $3$.
8. A: $\frac{2}{3}$; B: $2$. A is more consistent.
9. MAD $2$; count repeats separately.
10. $12, 12, 12, 12$ only.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

1. Mean: $\bar{x} = \frac{16}{4} = 4$.
2. Compute $|x - 4|$ for each value: $2, 0, 0, 2$. Their sum is $4$.
3. MAD $= \frac{4}{4} = 1$.

### Problem 2

1. Mean: $\bar{x} = \frac{16}{4} = 4$.
2. Compute $|x - 4|$ for each value: $3, 1, 1, 3$. Their sum is $8$.
3. MAD $= \frac{8}{4} = 2$.

### Problem 3

1. Mean: $\bar{x} = \frac{24}{4} = 6$.
2. Compute $|x - 6|$ for each value: $2, 0, 0, 2$. Their sum is $4$.
3. MAD $= \frac{4}{4} = 1$.

### Problem 4

1. Mean: $\bar{x} = \frac{12}{4} = 3$.
2. Compute $|x - 3|$ for each value: $3, 0, 0, 3$. Their sum is $6$.
3. MAD $= \frac{6}{4} = \frac{3}{2}$.

### Problem 5

1. The distance sum is $1 + 1 + 3 + 3 = 8$.
2. There are four values, so the MAD is $8 \div 4 = 2$.

### Problem 6

1. Mean: $\bar{x} = \frac{28}{4} = 7$.
2. Compute $|x - 7|$ for each value: $0, 0, 0, 0$. Their sum is $0$.
3. MAD $= \frac{0}{4} = 0$.
4. Every distance is zero, so all observations equal $7$: there is no spread.

### Problem 7

1. Mean: $\bar{x} = \frac{20}{4} = 5$.
2. Compute $|x - 5|$ for each value: $3, 3, 3, 3$. Their sum is $12$.
3. MAD $= \frac{12}{4} = 3$.

### Problem 8

1. A: mean $= 3$; distances $1, 0, 1$; MAD $= 2 \div 3 = \frac{2}{3}$.
2. B: mean $= 3$; distances $3, 0, 3$; MAD $= 6 \div 3 = 2$.
3. The smaller MAD shows greater consistency: A.

### Problem 9

1. Mean: $\bar{x} = \frac{28}{4} = 7$.
2. Compute $|x - 7|$ for each value: $2, 2, 2, 2$. Their sum is $8$.
3. MAD $= \frac{8}{4} = 2$.
4. Each repeated value is a separate observation, so both copies of $5$ and both copies of $9$ count.

### Problem 10

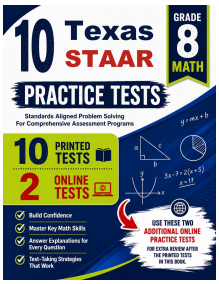
1. MAD $0$ means the sum of all nonnegative distances from the mean is $0$. Each distance must therefore be $0$.
2. Every value must equal the mean, $12$. Four such values are $12, 12, 12, 12$.

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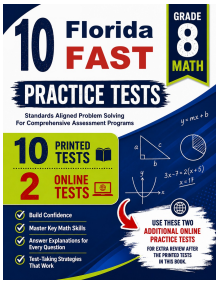

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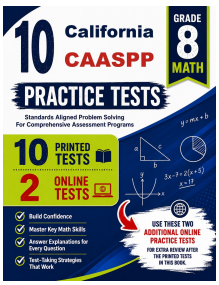

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