

# Mean Absolute Deviation

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Quick Review

The **mean absolute deviation** (MAD) measures how *spread out* a data set is — on average, how far each value sits from the mean. Here is the recipe: **(1)** find the **mean** of the data; **(2)** find each value's **distance** from the mean (always positive, that is the *absolute* part); **(3)** take the **mean of those distances**. A *small* MAD means the data is clustered tightly near the mean; a *large* MAD means the data is more scattered. MAD is never negative, and it is 0 only when every value is identical.

◇ **Example:** Find the mean absolute deviation of 3, 5, 7, 9, 11.

⇒ Step one, the mean:  $\frac{3+5+7+9+11}{5} = \frac{35}{5} = 7$ . Step two, the distance of each value from 7:  $|3 - 7| = 4$ ,  $|5 - 7| = 2$ ,  $|7 - 7| = 0$ ,  $|9 - 7| = 2$ ,  $|11 - 7| = 4$ . Step three, average those distances:  $\frac{4+2+0+2+4}{5} = \frac{12}{5} = 2.4$ . So on average each value is 2.4 units from the mean — that is the MAD.

**Answer:** MAD =  $\frac{12}{5} = 2.4$

## PRACTICE

Find the mean absolute deviation (MAD) of each data set.

- |                   |       |                        |       |
|-------------------|-------|------------------------|-------|
| 1. 2, 4, 6        | _____ | 11. 12, 14, 16, 18     | _____ |
| 2. 5, 5, 5, 5     | _____ | 12. 20, 22, 24, 26, 28 | _____ |
| 3. 1, 2, 3, 4, 5  | _____ | 13. 1, 5, 9            | _____ |
| 4. 10, 20, 30     | _____ | 14. 7, 7, 7, 7, 7      | _____ |
| 5. 4, 4, 4, 8     | _____ | 15. 2, 6, 10, 14       | _____ |
| 6. 2, 2, 8, 8     | _____ | 16. 5, 10, 15, 20, 25  | _____ |
| 7. 6, 7, 8, 9, 10 | _____ | 17. 3, 8, 13           | _____ |
| 8. 0, 10          | _____ | 18. 9, 9, 9, 15        | _____ |
| 9. 3, 3, 3, 9     | _____ | 19. 4, 8, 12, 16, 20   | _____ |
| 10. 1, 1, 1, 1, 6 | _____ | 20. 10, 10, 10, 10, 30 | _____ |

### Word Problems

21. Five days of rainfall (in mm) were 2, 6, 10, 14, 8. Find the MAD and explain what it tells you. \_\_\_\_\_
22. Two players' quiz scores: Ana had 7, 8, 9, 8 and Ben had 2, 14, 6, 10. Whose scores are more consistent? \_\_\_\_\_
23. A baker weighs 5 loaves (in oz): 16, 16, 16, 16, 16. Find the MAD and say what it means. \_\_\_\_\_
24. Daily temperatures one week were 10, 20, 30 degrees on three days. Find the MAD and describe the spread. \_\_\_\_\_



## Answer Keys

1.  $\frac{4}{3}$
2. 0
3.  $\frac{6}{5}$
4.  $\frac{20}{3}$
5.  $\frac{3}{2}$
6. 3
7.  $\frac{6}{5}$
8. 5
9.  $\frac{9}{4}$
10.  $\frac{8}{5}$
11. 2
12.  $\frac{12}{5}$
13.  $\frac{8}{3}$

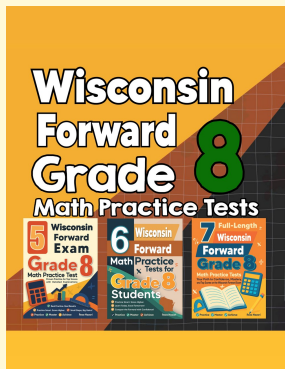
14. 0
15. 4
16. 6
17.  $\frac{10}{3}$
18.  $\frac{9}{4}$
19.  $\frac{24}{5}$
20.  $\frac{32}{5}$
21. mean = 8, MAD =  $\frac{16}{5} = 3.2$
22. Ana (MAD  $\frac{1}{2}$ ) is more consistent than Ben (MAD 4)
23. MAD = 0
24. mean = 20, MAD =  $\frac{20}{3} \approx 6.7$

### Step-by-Step Explanations

1. Mean = 4. Distances: 2, 0, 2. MAD =  $\frac{4}{3}$ .
2. Every value equals the mean 5, so all distances are 0 and MAD = 0.
3. Mean = 3. Distances: 2, 1, 0, 1, 2, summing to 6; MAD =  $\frac{6}{5} = 1.2$ .
4. Mean = 20. Distances: 10, 0, 10. MAD =  $\frac{20}{3}$ .
5. Mean = 5. Distances: 1, 1, 1, 3, summing to 6; MAD =  $\frac{6}{4} = \frac{3}{2}$ .
6. Mean = 5. Distances: 3, 3, 3, 3. MAD = 3.
7. Mean = 8. Distances: 2, 1, 0, 1, 2, summing to 6; MAD =  $\frac{6}{5} = 1.2$ .
8. Mean = 5. Distances: 5, 5. MAD = 5.
9. Mean =  $\frac{18}{4} = 4.5$ . Distances: 1.5, 1.5, 1.5, 4.5, summing to 9; MAD =  $\frac{9}{4} = 2.25$ .
10. Mean = 2. Distances: 1, 1, 1, 1, 4, summing to 8; MAD =  $\frac{8}{5} = 1.6$ .
11. Mean = 15. Distances: 3, 1, 1, 3, summing to 8; MAD =  $\frac{8}{4} = 2$ .
12. Mean = 24. Distances: 4, 2, 0, 2, 4, summing to 12; MAD =  $\frac{12}{5} = 2.4$ .
13. Mean = 5. Distances: 4, 0, 4, summing to 8; MAD =  $\frac{8}{3}$ .
14. All values equal the mean 7, so every distance is 0 and MAD = 0.
15. Mean = 8. Distances: 6, 2, 2, 6, summing to 16; MAD =  $\frac{16}{4} = 4$ .
16. Mean = 15. Distances: 10, 5, 0, 5, 10, summing to 30; MAD =  $\frac{30}{5} = 6$ .
17. Mean = 8. Distances: 5, 0, 5, summing to 10; MAD =  $\frac{10}{3}$ .
18. Mean =  $\frac{42}{4} = 10.5$ . Distances: 1.5, 1.5, 1.5, 4.5, summing to 9; MAD =  $\frac{9}{4} = 2.25$ .
19. Mean = 12. Distances: 8, 4, 0, 4, 8, summing to 24; MAD =  $\frac{24}{5} = 4.8$ .
20. Mean = 14. Distances: 4, 4, 4, 4, 16, summing to 32; MAD =  $\frac{32}{5} = 6.4$ .
21. The mean is  $\frac{2+6+10+14+8}{5} = \frac{40}{5} = 8$ . Distances from 8 are 6, 2, 2, 6, 0, summing to 16, so MAD =  $\frac{16}{5} = 3.2$  mm — each day's rainfall is about 3.2 mm from the average.
22. Ana's mean is 8; distances 1, 0, 1, 0 give MAD =  $\frac{2}{4} = \frac{1}{2}$ . Ben's mean is 8; distances 6, 6, 2, 2 give MAD = 4. The smaller MAD means Ana is far more consistent.
23. Every loaf weighs exactly the mean, 16 oz, so each distance is 0 and MAD = 0 — the loaves are perfectly uniform with no spread.
24. The mean is 20. Distances from 20 are 10, 0, 10, summing to 20, so MAD =  $\frac{20}{3} \approx 6.7$  degrees — a fairly large spread.



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