

Algebra 1 • Unit 1 • Assessment Guide

One-Variable Statistics

For the Parent or Teacher — What to look for

Unit 1 returns to data displays and statistics, with a new focus on interpretation and standard deviation as a measure of variability. Watch for whether the student can READ the meaning of these numbers, not just compute them. A student can be right for the wrong reason and wrong for the right reason — both matter.

Problem 1 — Two classes' sleep data

- (a) Class B has greater variability — values spread from 4 to 12 vs. 6 to 10 in A. Strong response: notes the range or describes the spread visually rather than computing SD.
- (b) THE diagnostic — same median does not mean same distribution. Strong: explicitly says "the median only tells us the middle, not how spread out the data is."
- Weak: "they're the same because medians are equal." That's exactly the misconception this unit targets.

Problem 2 — Left-skewed sketch

- (a) Tail should go LEFT (low side). Common error: students draw right-skew because "skew left" sounds like "leaning left" visually.
- (b) Mean < median. The mean is PULLED toward the long tail.
- Strong: explains using the idea that the mean is sensitive to extreme values; the few low scores drag it down.

Problem 3 — Compute and the effect of an extreme value

- (a) Mean = 17.375. (b) Median = 16.5. (c) Q1 = 14, Q3 = 20.5, IQR = 6.5.
- (d) After adding 80: new mean $\approx$ 24.33, new median = 18. Mean jumps about 7; median moves about 1.5.
- (e) ★ The diagnostic. Strong: "The mean uses every value so it's pulled by extremes; the median only depends on the middle, so one big number can't move it much."

Problem 4 — Same mean, different SD

- Set Y has much larger SD (values spread 30-70 vs. 48-52 in X).
- Strong: "SD measures spread, and Y's values are much further from 50."
- Weak: tries to compute SD; or guesses that the set with the larger values has the larger SD (incorrect reasoning).

Problem 5 — Mean vs. median debate

- A nuanced answer is the goal. Strong: gives example where median is better (skewed data — incomes, home prices) AND where mean is better (symmetric data; when you need the total).
- Weak: agrees or disagrees without examples, or only memorizes "median is robust to outliers" without showing they understand why.

Problem 6 — Han's SD = 2 for constant data

- The actual SD is 0 (zero variability). Strong response: "every value equals the mean, so all deviations are 0, so the SD must be 0."
- What Han probably did: confused SD with something else (the value of the data? the count?). Or applied a formula incorrectly.

- ★ This question tests whether the student understands SD CONCEPTUALLY, not just procedurally.

Problem 7 — Box plot of rents + outlier rule

- (a) $IQR = 1300 - 900 = 400$. Upper fence = $1300 + 1.5(400) = 1900$. $\$5500 > 1900$, so YES it is an outlier.
- (b) Removing $\$5500$: mean DROPS noticeably; median changes little or not at all; IQR essentially unchanged.
- (c) Use MEDIAN — neighborhood has a luxury outlier; median represents the "typical" rent better.
- Strong: shows the 1.5-IQR computation and connects (b) to robustness of the median.

Problem 8 — Two basketball players, same mean

- (a) Player A — consistent, low SD. Reliable in close games.
- (b) Player B — high SD; the 35 game is more likely from a player with that kind of variability.
- (c) ★ The conceptual capstone: a single statistic hides a lot. The full distribution (or at least center AND spread) tells the real story.
- Watch for students who pick Player B for (a) because they have a 35-point game — they're not thinking about reliability.

Problem 9 — Design a statistical question

- Strong: question is genuinely statistical (answer involves variability), specific population identified, sample method described, choice of display matches data type, and center/spread choice reflects expected shape.
- Weak: question has a single right answer ("What's the school's enrollment?") — that's not statistical.
- ★ This is the modeling capstone of the unit; treat the rubric holistically.

Problem 10 — True/false

- (a) F — same mean does not mean same shape (see Problem 1).
- (b) F — SD is a measure of distance; always ≥ 0 .
- (c) T — multiplying every value by a constant k scales SD by $|k|$.
- (d) F — adding a constant to every value DOES change the median (it shifts) but does NOT change the IQR or SD.
- (d) is the most diagnostic — students must distinguish CENTER (shifts) from SPREAD (unchanged) under translation.

— end —