Center, the Mean and the Median

Students compute the mean and median, see the mean as a balance point and learn the symbols x-bar and mu, watch an extreme value move the mean but not the median, and choose the center that fits the shape.

TIME	40 minutes (one student with a parent or tutor, or a small group)
WHO	Math 1 (algebra readiness), about age 12. Follows Unit 12, Lesson 1.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 interactive page for this lesson (balance-point tool), pencil, calculator
PRIOR KNOWLEDGE	Mean and median (6th grade). The midpoint as an average (Unit 11). Shape and skew (Lesson 1).
STANDARDS	NC.M1.S-ID.2, NC.M1.S-ID.3.
KEEP OUT	Spread (Lesson 3). The outlier rule (Lesson 4).

Learning goals

1. Compute the mean and the median by hand on small sets and with technology on larger ones.
2. Explain the mean as the balance point and name x-bar and mu.
3. Show that an extreme value moves the mean but not the median, and explain why the median is resistant.
4. Choose the center that fits the shape and say it in context.

Vocabulary: say both, every time

The rule for the whole lesson: whenever the adult or the student says a math word, they follow it with the plain-English version. Proper term first, plain English second, until the student does it without being asked.

TERM	LOOKS LIKE	PLAIN ENGLISH
Mean	add and divide	The balance point.
$\bar{x}$, μ	sample, population	Same calculation.
Median	the middle in order	Average two middles if even.
Resistant	not pulled	The median.

> THE ONE SENTENCE TO SAY OUT LOUD
>
> The mean balances, the median resists. The shape picks the center.

Lesson timeline (40 minutes)

0:00 to 0:05	Warm-up: two middles. 7, 9, 12, 4, 8: the mean and the median. Both 8. Then 5, 5, 6, 30: mean 11.5, median 5.5. Why so different?
0:05 to 0:17	Mini-lesson: mean, symbols, median. Add and divide; the balance point; x-bar and mu. Order, then the middle. The class periods: 58.2 and 60. Slide the last value to 100 in the tool and watch.
0:17 to 0:25	Resistant. Why the mean moved and the median did not. The shape picks the center. The songs: 15.8 against 12, and the sentence in context.
0:25 to 0:36	Practice. The practice problems or Worksheet Parts A to C. Same buttons: Hint, Show next step, Reveal answer, Hide help.
0:36 to 0:40	Exit ticket. Worksheet Part E. Success looks like 8 and 8, the mean rising with the median fixed at 60, and the order reason.

Misconceptions to listen for

- **The median is the middle of the unordered list.** Order first.
- **The mean is always the best center.** Not for skewed data.
- **x-bar and mu are different formulas.** Same formula, different group.
- **An extreme value changes everything.** It changes the mean, not the median.

Support and stretch

Support

Use counters on a number line to find the balance point physically. Have the student rewrite every list in order before finding the median.

Stretch

Ask how large the added value must be to move the median of the eleven periods at all (it cannot, from above: the median is already stuck between 60s). Ask for a data set whose mean is 10 and median is 2.

Where this goes next

Lesson 3: spread. The IQR, and the standard deviation built from the mean absolute deviation.

> THE HABIT TO BUILD
>
> Add and divide for the mean; order, then the middle for the median; let the shape pick.