



Measures of center and variability

GRADE 6 MATH

Answer keys for the exit ticket, practice worksheet, and homework, plus notes for the lesson slides. Each answer shows the steps and the most likely wrong answer (“If wrong”), so you can tell what a mistake means, not just that it is one. Questions go from **fluency** to **application** to **reasoning**.

Exit Ticket — answer key

Use: End of the center-and-variability lesson. 5–8 min, independent. Item 4 separates the two ideas cleanly, which items 1–3 cannot do on their own.

Timing: 5–8 min · independent. A signed-deviation error on item 2 (MAD of 0) is the tell that ‘absolute’ has not landed.

1. Mean and median of 3, 4, 5, 6, 7? **FLUENCY**

Answer: **Both 5**

1. Mean: sum 25, divide by 5 $\rightarrow$ 5.
2. Median: five values in order, the middle one is 5.
3. They agree because the data is symmetric.

If wrong: Gave 4 as the median by counting positions rather than finding the middle value.

2. Range and MAD of 3, 4, 5, 6, 7? **APPLICATION**

Answer: **Range 4; MAD 1₅**

1. Range: $7 - 3 = 4$.
2. MAD: distances from the mean of 5 are 2, 1, 0, 1, 2.
3. Add them: $2 + 1 + 0 + 1 + 2 = 6$. Divide by 5: $\frac{6}{5} = 1\frac{1}{5}$.
4. MAD says the values sit about 1.2 units from the mean on average.

If wrong: Kept the signs when finding distances, so they summed to 0. Distance is never negative — that is what ‘absolute’ means.

3. Mean and median of 4, 5, 6, 7, 68 — which is the better center? REASONING

Answer: **Mean 18, median 6; the MEDIAN is the better center**

1. Mean: sum 90, divide by 5 → 18.
2. Median: the middle value is 6.
3. The mean of 18 is larger than four of the five values, so it does not describe where the data sits.
4. One extreme value, 68, dragged the mean up. The median ignores the size of that value and only counts its position.
5. When a data set has an outlier, the median describes the center better.

If wrong: Chose the mean because it uses every value. Using every value is exactly why one extreme value can distort it.

4. Range and MAD of 10, 10, 10, 10 — is there still a center? REASONING

Answer: **Range 0, MAD 0; yes, the center is 10**

1. Range: $10 - 10 = 0$. MAD: every value is 0 away from the mean, so the MAD is 0.
2. Zero variability means the values do not differ at all.
3. There is still a center: mean and median are both 10.
4. Center and variability are separate questions. Zero variability does not mean there is no center — it means every value IS the center.

If wrong: Said there is no center because the range is 0. A range of 0 is a statement about spread, not about whether a center exists.

Quick answers for fast checking:

#	Level	Answer
1	fluency	both 5
2	application	range 4, MAD 1,
3	reasoning	mean 18, median 6, use the median
4	reasoning	range 0, MAD 0, center 10

Practice Worksheet — answer key

Use: During the lesson after the deck. Item 8 is the center/variability confusion stated outright; item 9 shows that 0 is a real answer.

Timing: 15–25 min · pairs or independent · circulate on 4 and 7. For the MAD, insist students write the distances as a list before averaging.

1. Mean of 2, 6, 7, 9? FLUENCY

Answer: **6**

1. Sum 24, divide by 4 $\rightarrow$ 6.

If wrong: Divided by 3 instead of 4.

2. Median of 2, 6, 7, 9? FLUENCY

Answer: **$6\frac{1}{2}$**

1. Four values, so average the middle two: $(6 + 7) \div 2 = 6\frac{1}{2}$.

If wrong: Picked 6 or 7 without averaging.

3. Range of 2, 6, 7, 9? FLUENCY

Answer: **7**

1. $9 - 2 = 7$.

If wrong: Gave the list of values.

4. MAD of 2, 6, 7, 9? APPLICATION

Answer: **2**

1. The mean is $24 \div 4 = 6$.

2. Distances from 6: $|2 - 6| = 4$, $|6 - 6| = 0$, $|7 - 6| = 1$, $|9 - 6| = 3$.

3. Add the distances: $4 + 0 + 1 + 3 = 8$.

4. Divide by how many values there are: $8 \div 4 = 2$.

5. On average the values sit 2 units away from the mean.

If wrong: Kept signs, giving $(-4 + 0 + 1 + 3) \div 4 = 0$. Deviations are always positive.

5. Mean of 12, 13, 14, 61? APPLICATION

Answer: **25**

1. Sum: $12 + 13 + 14 + 61 = 100$. Divide by 4 $\rightarrow$ 25.

2. The mean is larger than three of the four values.

If wrong: Estimated 13 from the cluster and ignored the 61.

6. Median of 12, 13, 14, 61? APPLICATION

Answer: **$13\frac{1}{2}$**

1. In order: 12, 13, 14, 61. Average the middle two: $(13 + 14) \div 2 = 13\frac{1}{2}$.

If wrong: Answered 14 without averaging.

7. Which measure describes the center of 12, 13, 14, 61? REASONING

Answer: **The median, $13\frac{1}{2}$**

1. Mean 25, median $13\frac{1}{2}$.
2. Three of the four values lie between 12 and 14, so the data sits near 13.
3. The mean of 25 is nowhere near any actual value — the single 61 pulled it there.
4. The median stays with the bulk of the data because only the POSITION of 61 matters to it, not its size.
5. With an outlier present, prefer the median.

If wrong: Chose the mean because it is the familiar 'average'. Familiarity is not the criterion; fit to the data is.

8. Student answered '4' for the center of 3, 4, 5, 6, 7 via $7 - 3$ REASONING

Answer: **They found the RANGE, a measure of variability; the center is 5**

1. $7 - 3 = 4$ is the range — how spread out the data is.
2. The question asked for the center — where the data sits — which is 5 for both mean and median.
3. Center and variability answer different questions: WHERE is it, versus HOW SPREAD OUT is it.
4. The coincidence that 4 is also a value in the set makes the error easy to miss.

If wrong: Marked the answer simply wrong. It is a correct computation of a different quantity, which is a more useful thing to name.

9. MAD of 7, 7, 7 — what does MAD 0 mean? REASONING

Answer: **MAD 0 — every value is identical**

1. The mean is 7. Each distance is $|7 - 7| = 0$.
2. Average of 0, 0, 0 is 0.
3. A MAD of 0 means no value differs from the mean at all, so every value is the same.
4. It is the only way a MAD can be 0 — distances cannot be negative, so they cannot cancel out.

If wrong: Said MAD 0 means the data is missing or the calculation failed. It is a meaningful result: perfectly consistent data.

Quick answers for fast checking:

#	Level	Answer
1	fluency	6
2	fluency	$6\frac{1}{2}$
3	fluency	7
4	application	2
5	application	25
6	application	$13\frac{1}{2}$
7	reasoning	the median, $13\frac{1}{2}$
8	reasoning	they found the range; center 5
9	reasoning	MAD 0, all values equal

Homework — answer key

Use: Parallels the practice sheet. Item 2 slips in a mode/median confusion that the practice sheet does not test.

Timing: ~15 min at home · independent · review item 4 as the next-day warm-up, writing the distance list on the board.

1. Mean of 4, 4, 6, 10? FLUENCY

Answer: **6**

1. Sum 24, divide by 4 → 6.

If wrong: Divided by 3.

2. Median of 4, 4, 6, 10? FLUENCY

Answer: **5**

1. Four values, so average the middle two: $(4 + 6) \div 2 = 5$.

If wrong: Picked 4 because it repeats. A repeated value is the mode, not the median.

3. Range of 4, 4, 6, 10? FLUENCY

Answer: **6**

1. $10 - 4 = 6$.

If wrong: Gave a list.

4. MAD of 4, 4, 6, 10? APPLICATION

Answer: **2**

1. The mean is 6.

2. Distances from 6: $|4 - 6| = 2$, $|4 - 6| = 2$, $|6 - 6| = 0$, $|10 - 6| = 4$.

3. Add: $2 + 2 + 0 + 4 = 8$. Divide by 4: 2.

4. On average the values sit 2 units from the mean.

If wrong: Kept the signs, giving $(-2 - 2 + 0 + 4) \div 4 = 0$.

5. Mean of 20, 21, 22, 97? APPLICATION

Answer: **40**

1. Sum: $20 + 21 + 22 + 97 = 160$. Divide by 4 $\rightarrow 40$.

2. The mean exceeds three of the four values.

If wrong: Estimated 21 from the cluster.

6. Median of 20, 21, 22, 97? APPLICATION

Answer: **$21\frac{1}{2}$**

1. In order: 20, 21, 22, 97. Average the middle two: $(21 + 22) \div 2 = 21\frac{1}{2}$.

If wrong: Answered 22 without averaging.

7. Which measure describes the center of 20, 21, 22, 97? REASONING

Answer: **The median, $21\frac{1}{2}$**

1. Mean 40, median $21\frac{1}{2}$.
2. Three of the four values sit between 20 and 22, so the data clusters near 21.
3. The mean of 40 matches no actual value — the 97 pulled it up.
4. The median stays with the bulk because only the position of 97 counts, not its size.

If wrong: Chose the mean out of habit. Check whether the answer sits near the actual data before accepting it.

8. Range and MAD of 5, 5, 5, 5 — what do the zeros tell you? REASONING

Answer: **Both 0 — the values are perfectly consistent**

1. Range: $5 - 5 = 0$. Mean is 5, every distance is 0, so $MAD = 0$.
2. Both measure variability, and both say there is none.
3. Every value equals the center, 5.
4. Two zeros here are not an error or missing data — they are the strongest possible statement of consistency.

If wrong: Concluded that the data set is empty or the working went wrong. Zero variability is a real and informative result.

Quick answers for fast checking:

#	Level	Answer
1	fluency	6
2	fluency	5
3	fluency	6
4	application	2
5	application	40
6	application	$21\frac{1}{2}$
7	reasoning	the median, $21\frac{1}{2}$
8	reasoning	both 0, perfectly consistent

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Introduces MAD, which SP-06 and SP-07 both build on.

Slide	~Time	Note
1/8	0:00	Frame it: a single number can summarise a data set, but you must know which question it answers.
2/8	1:00	Hook — poll on whether the mean is fair. Do NOT resolve. Let someone compute 18 and feel that it is wrong.
3/8	3:00	Separate the two jobs explicitly and keep them separate for the rest of the lesson.
4/8	5:00	WE1 — resolve the hook. The key line: the median cares about POSITION, the mean cares about SIZE.
5/8	7:30	WE2 — MAD step by step. Have students write the distance list before averaging; skipping that step is where signs creep back in.
6/8	10:30	CFU — all-student response. Answer 2. A response of 0 means signs were kept.
7/8	12:30	Name the center/variability confusion directly. Close on $MAD = 0$ being informative, not an error.
8/8	14:00	Launch the in-class practice sheet.