



Center, spread & shape of a distribution

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 distributions lesson. 5–8 min, independent. Items 2 and 3 are deliberate mirrors — a student using the peak rule gets both wrong the same way.

Timing: 5–8 min · independent. Two mirrored errors on 2 and 3 is a clean diagnosis, not two separate problems.

1. Center and spread of 2, 3, 4, 4, 4, 5, 6? **FLUENCY**

Answer: **Center 4; spread 4**

1. The values cluster at 4, which is also the middle value.
2. Spread: $6 - 2 = 4$.
3. This one is symmetric, so the mean is also 4.

If wrong: Gave the spread as the list of values rather than a single number. Spread is one number: highest – lowest.

2. Shape of 1, 1, 2, 2, 2, 3, 9? **APPLICATION**

Answer: **Skewed right; the peak is on the LEFT**

1. Most values bunch at the low end, around 1–3.
2. The single value 9 stretches far out to the right, forming a long tail.
3. Named for the tail → skewed right, with the peak on the left.

If wrong: Answered skewed left because the peak is on the left. The name follows the tail, not the hump.

3. Shape of 1, 7, 8, 8, 8, 9, 9? APPLICATION

Answer: **Skewed left; the peak is on the RIGHT**

1. Most values bunch at the high end, around 7–9.
2. The single value 1 stretches far out to the left, forming a long tail.
3. Named for the tail → skewed left, with the peak on the right.

If wrong: Answered skewed right because the peak is on the right — the same error mirrored.

4. Why is a long left tail called ‘skewed left’? REASONING

Answer: **Because the name describes the direction the tail stretches, not where the bulk sits**

1. “Skew” means pulled out of shape, and the tail is the part being pulled.
2. The tail points left, so the distribution is skewed left, even though the peak is on the right.
3. A useful check: the few extreme low values drag the MEAN below the median. If the mean is less than the median, the tail is on the left.
4. Reading the peak instead of the tail gives you the answer backwards every time.

If wrong: Explained that most of the data is on the left, which describes a different distribution entirely.

Quick answers for fast checking:

#	Level	Answer
1	fluency	center 4, spread 4
2	application	skewed right, peak left
3	application	skewed left, peak right
4	reasoning	the name follows the tail

Practice Worksheet — answer key

Use: During the lesson after the deck. Items 6–9 all use the same data set so students can see one outlier act differently on mean, median and spread.

Timing: 15–25 min · pairs or independent · circulate on 6 and 9. Keep exact fractions; rounding hides the outlier's effect.

1. Median of 3, 5, 7, 9, 11? FLUENCY

Answer: **7**

1. Five values in order; the middle one is 7.

If wrong: Gave 5 by counting positions instead of finding the middle.

2. Spread of 3, 5, 7, 9, 11? FLUENCY

Answer: **8**

1. $11 - 3 = 8$.

If wrong: Listed all the gaps instead of giving one number.

3. Mean of 2, 4, 6, 8? FLUENCY

Answer: **5**

1. Sum 20, divide by 4: $20 \div 4 = 5$.

If wrong: Gave 6 by taking a middle value rather than computing.

4. Median of 2, 4, 6, 8? APPLICATION

Answer: **5**

1. Four values, so average the middle two: $(4 + 6) \div 2 = 5$.
2. With an even count the median need not be a value in the set.

If wrong: Picked 4 or 6. With an even number of values you must average the middle pair.

5. Mean vs median for 2, 4, 6, 8? APPLICATION

Answer: **Both are 5 — the distribution is symmetric**

1. Mean = 5 and median = 5.
2. When mean and median agree, no tail is pulling one away from the other.
3. So the distribution is symmetric — evenly balanced about its center.

If wrong: Concluded it was skewed because the values increase. Rising values are not a tail; what matters is the balance about the center.

6. Mean vs median for 2, 3, 4, 20 — shape? REASONING

Answer: **Mean is greater than the median; skewed right**

1. Mean = $29 \div 4 = 7\frac{1}{4}$. Median = $(3 + 4) \div 2 = 3\frac{1}{2}$.
2. The mean is much larger, dragged up by the single value 20.
3. A tail stretching to the right pulls the mean to the right → skewed right.
4. The peak is on the LEFT, where 2, 3 and 4 sit.

If wrong: Answered skewed left because most values are on the left. Once again: name it for the tail.

7. Mean of 2, 3, 4, 20? APPLICATION

Answer: **$7\frac{1}{4}$**

1. Sum: $2 + 3 + 4 + 20 = 29$. Divide by 4: $29 \div 4 = 7\frac{1}{4}$.
2. Notice the mean is larger than three of the four values.

If wrong: Rounded to 7. Keep the exact value — the fraction is what shows how far the outlier pulls.

8. Median of 2, 3, 4, 20? APPLICATION

Answer: **$3\frac{1}{2}$**

1. In order: 2, 3, 4, 20. Average the middle two: $(3 + 4) \div 2 = 3\frac{1}{2}$.
2. The 20 does not move the median at all — only its position counts, not its size.

If wrong: Answered 4 by picking a middle value rather than averaging the pair.

9. Spread of 2, 3, 4, 20, and why can spread mislead? REASONING

Answer: **Spread 18 — it is set entirely by the one extreme value**

1. Spread: $20 - 2 = 18$.
2. But three of the four values sit within 2 units of each other, between 2 and 4.
3. A spread of 18 suggests the data is widely scattered, when in fact it is tightly bunched with one distant value.
4. Spread uses only the two extremes, so a single outlier controls it completely. That is why we also look at shape and center.

If wrong: Said the spread is simply wrong. It is correctly computed — the point is that one number cannot describe a distribution on its own.

Quick answers for fast checking:

#	Level	Answer
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1	fluency	7
2	fluency	8
3	fluency	5
4	application	5
5	application	both 5, symmetric
6	reasoning	mean > median, skewed right
7	application	$7\frac{1}{4}$
8	application	$3\frac{1}{2}$
9	reasoning	spread 18, driven by one value

Homework — answer key

Use: Parallels the practice sheet but mirrors it: here the outlier is LOW, so the mean drops below the median and the skew is left. Students who memorised ‘outlier means skewed right’ are caught.

Timing: ~15 min at home · independent · review item 5 beside practice item 6 as the next-day warm-up; the pair makes the direction rule visible.

1. Median of 10, 12, 14, 16, 18? FLUENCY

Answer: 14

1. Five values; the middle one is 14.

If wrong: Counted positions instead of values.

2. Spread of 10, 12, 14, 16, 18? FLUENCY

Answer: 8

1. $18 - 10 = 8$.

If wrong: Listed the gaps.

3. Mean of 5, 5, 6, 8? FLUENCY

Answer: 6

1. Sum 24, divide by 4: $24 \div 4 = 6$.

If wrong: Answered 5 by picking the repeated value.

4. Median of 5, 5, 6, 8? APPLICATION

Answer: $5\frac{1}{2}$

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

If wrong: Picked 5 or 6 instead of averaging.

5. Mean vs median for 1, 8, 9, 10 — shape? REASONING

Answer: **Mean is less than the median; skewed left**

1. Mean = $28 \div 4 = 7$. Median = $(8 + 9) \div 2 = 8\frac{1}{2}$.
2. The mean is smaller, dragged down by the single low value 1.
3. A tail stretching to the left pulls the mean left → skewed left.
4. The peak is on the RIGHT, where 8, 9 and 10 sit.

If wrong: Answered skewed right because most values are on the right. Name it for the tail.

6. Mean of 1, 8, 9, 10? APPLICATION

Answer: **7**

1. Sum: $1 + 8 + 9 + 10 = 28$. Divide by 4: 7.
2. The mean is below three of the four values, which is the outlier's doing.

If wrong: Answered 8 by estimating from the cluster and ignoring the 1.

7. Median of 1, 8, 9, 10? APPLICATION

Answer: $8\frac{1}{2}$

1. In order: 1, 8, 9, 10. Average the middle two: $(8 + 9) \div 2 = 8\frac{1}{2}$.
2. The low value of 1 does not move the median — only its position counts.

If wrong: Answered 8 or 9 without averaging.

8. Spread of 1, 8, 9, 10, and what does it tell you? REASONING

Answer: **Spread 9 — it captures the range but hides the clustering**

1. Spread: $10 - 1 = 9$.
2. It tells you the data covers 9 units from lowest to highest.
3. It does NOT tell you that three of the four values sit within 2 units of each other, between 8 and 10.
4. Spread depends only on the two extremes, so it says nothing about how the values in between are arranged. Shape and center fill that gap.

If wrong: Concluded the data is evenly spread across 9 units. Spread gives the width of the data, not how it is distributed inside that width.

Quick answers for fast checking:

#	Level	Answer
1	fluency	14
2	fluency	8
3	fluency	6
4	application	$5\frac{1}{2}$
5	reasoning	mean < median, skewed left
6	application	7
7	application	$8\frac{1}{2}$
8	reasoning	spread 9, hides clustering

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Slide 4 is the one to slow down on — the peak-versus-tail error is the most persistent in the domain.

Slide	~Time	Note
1/8	0:00	Frame it: one number never describes a data set. You need three.
2/8	1:00	Hook — poll left vs right. Do NOT resolve. Most of the room will say left, because the hump is on the left.
3/8	3:00	The three descriptors. Keep spread as a single number from the start.
4/8	5:00	WE1 — resolve the hook. Draw the tail with your hand and say ‘the tail points right’. Physical gesture helps this stick.
5/8	7:00	WE2 — the mean/median test gives students a way to CHECK their reading of the shape instead of guessing from a picture.

6/8	10:00	CFU — all-student response. Answer: skewed left, peak on the right. This is slide 4 mirrored; watch for the same error flipped.
7/8	12:00	Why all three descriptors are needed. Sets up SP-03, where center and variability each get a single number.
8/8	14:00	Launch the in-class practice sheet.