



Displaying data in histograms

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 histogram lesson, straight after dot plots. 5–8 min, independent. Item 3 is the whole point of the lesson.

Timing: 5–8 min · independent. An answer of 99 on item 3 means the dot-plot habit of reading exact values has carried over.

1. How many students took the test?

FLUENCY

Answer: **28**

1. Add the frequencies: $3 + 8 + 12 + 5 = 28$.
2. Each bar's height is a count of students, so the total is the sum of the heights.

If wrong: Answered 4 by counting the bins rather than adding the students in them.

2. Which bin has the most students?

FLUENCY

Answer: **80–89, with 12 students**

1. The tallest bar is over 80–89 and reaches 12.
2. Name the bin by its interval, not by the height.

If wrong: Answered ‘12’ alone. The question asks which bin as well as how many.

3. Can you find the highest score?

REASONING

Answer: **No — only that it is somewhere in 90–99**

1. The last bin tells you 5 students scored between 90 and 99.
2. It does not say whether the top score was 90, 99, or anything in between.
3. Grouping into bins throws away the individual values; only the counts survive.
4. This is the key difference from a dot plot, where every value can be read back.

If wrong: Answered 99, assuming the bin's top value was achieved. Nobody may have scored 99 at all.

4. How many scored 80+, and below 80? REASONING

Answer: **17 scored 80 or above; 11 scored below 80**

1. 80 or above: the 80–89 and 90–99 bins $\rightarrow 12 + 5 = 17$.
2. Below 80: the 60–69 and 70–79 bins $\rightarrow 3 + 8 = 11$.
3. Consistency check: $17 + 11 = 28$, which is the total number of students.
4. Every student falls in exactly one bin, so the two parts must add to the whole.

If wrong: Included the 70–79 bin in the ‘80 or above’ group. Then the parts sum to 25 rather than 28, which the check catches immediately.

Quick answers for fast checking:

#	Level	Answer
1	fluency	28
2	fluency	80–89, 12 students
3	reasoning	no — only the 90–99 range
4	reasoning	17 and 11, summing to 28

Practice Worksheet — answer key

Use: During the lesson after the deck. Item 7 is the histogram/bar-graph distinction; item 9 is the one that shows bin width is a decision, not a given.

Timing: 15–25 min · pairs or independent · circulate on 7 and 9. If time allows, have students actually redraw the two-bin version for item 9.

1. Bin width? FLUENCY

Answer: **10**

1. 60–69 covers 60, 61, ..., 69 — ten whole-number scores.
2. Every bin here is the same width, which is what makes the bars comparable.

If wrong: Answered 9 by computing $69 - 60$ and forgetting that both endpoints are included.

2. Students in 70–79? FLUENCY

Answer: **8**

1. The bar over 70–79 has height 8.

If wrong: Read the neighbouring bar.

3. Students in 90–99? FLUENCY

Answer: **5**

1. The bar over 90–99 has height 5.

If wrong: Answered 99, reading the axis label.

4. Scored at least 70? APPLICATION

Answer: **25**

1. Everyone except the 60–69 bin: $8 + 12 + 5 = 25$.
2. Or $28 - 3 = 25$.

If wrong: Answered 8 by taking only the 70–79 bin. 'At least 70' includes every bin above it too.

5. Scored below 90? APPLICATION

Answer: **23**

1. The first three bins: $3 + 8 + 12 = 23$.
2. Or $28 - 5 = 23$.

If wrong: Included the 90–99 bin, giving 28.

6. Fewest students? APPLICATION

Answer: **60–69, with 3 students**

1. The shortest bar is over 60–69, at height 3.

If wrong: Named the height only, or picked 90–99 because it is at the end.

7. Why do histogram bars touch? REASONING

Answer: **Because the bins are consecutive intervals on a continuous number line**

1. A histogram's horizontal axis is a NUMBER LINE, and 69 runs straight into 70 with nothing between.
2. Touching bars show that the intervals are adjacent and cover everything, with no scores left out.
3. A bar graph shows separate CATEGORIES — favourite colour, type of pet — which have no order and nothing between them, so gaps are correct there.
4. You can reorder a bar graph's bars without changing its meaning. Reorder a histogram's bins and it becomes nonsense.

If wrong: Answered that it just looks tidier. The touching is a statement about the data being continuous, not a style choice.

8. Why can't the histogram show the highest score is 99? REASONING

Answer: **Because binning discards the individual values**

1. The 90–99 bar says five students scored somewhere in that range.
2. Their actual scores could be 90, 91, 93, 94, 95 — with no 99 among them.
3. A histogram records only HOW MANY fall in each interval, never WHICH values.
4. Compare a dot plot: there, every observation is a separate dot, so the maximum is visible. That information is deliberately traded away for a clearer view of the shape.

If wrong: Reasoned that the bin is labelled 90–99 so 99 must occur. The label describes the interval, not the contents.

9. Same data, bins of width 20 — what is gained and lost? REASONING

Answer: **Gained: a simpler overall shape. Lost: detail within each bin**

1. Two bins would be 60–79 with $3 + 8 = 11$ students, and 80–99 with $12 + 5 = 17$.
2. Easier to see: the broad split, that more than half the class scored 80 or above.
3. Lost: that within 60–79 the students bunch in the upper half, and that the 90s are much less common than the 80s.
4. Wider bins smooth the picture; narrower bins show detail but can look noisy. The bin width is a choice, and it changes what the histogram appears to say.
5. The underlying data has not changed at all — only how it is grouped.

If wrong: Said the data would change. The 28 scores are identical; only the grouping differs.

Quick answers for fast checking:

#	Level	Answer
1	fluency	10
2	fluency	8
3	fluency	5
4	application	25
5	application	23
6	application	60–69, 3 students
7	reasoning	the axis is continuous
8	reasoning	binning discards values
9	reasoning	shape gained, detail lost

Homework — answer key

Use: Parallels the practice sheet. Item 6 is subtler than it looks — equal halves are not the same as symmetry, and students who learned SP-02 quickly will overreach here.

Timing: ~15 min at home · independent · review item 6 as the next-day warm-up; it is the most common overgeneralisation in the batch.

1. Total from 5, 9, 10, 4? FLUENCY

Answer: 28

1. $5 + 9 + 10 + 4 = 28$.

If wrong: Answered 4 by counting bins.

2. Largest frequency? FLUENCY

Answer: 10

1. The tallest bar has height 10.

If wrong: Gave the bin label instead of the height.

3. Smallest frequency? FLUENCY

Answer: 4

1. The shortest bar has height 4.

If wrong: Answered 0, assuming an empty bin.

4. First two bins? APPLICATION

Answer: **14**

1. $5 + 9 = 14$.

If wrong: Took only the first bin.

5. Last two bins? APPLICATION

Answer: **14**

1. $10 + 4 = 14$.

If wrong: Took only the last bin.

6. What does the comparison tell you? REASONING

Answer: **The two halves hold equal counts, 14 each — the data is balanced overall**

1. First half 14, second half 14, so exactly half the values fall on each side.
2. That means the middle of the data sits at the boundary between the second and third bins.
3. Balanced HALVES do not by themselves mean the distribution is symmetric — within each half the values could still be lopsided, since 5 and 9 are quite different while 10 and 4 differ the other way.
4. So: balanced in total, but the individual bars are not mirror images.

If wrong: Concluded the distribution must be symmetric. Equal halves are necessary for symmetry but not sufficient; the bar heights within each half must mirror too.

7. One thing each display does better REASONING

Answer: **Dot plot: shows every individual value. Histogram: handles large data sets and shows shape clearly**

1. A dot plot keeps each observation as its own dot, so you can find the exact maximum, minimum, and rebuild the original list.
2. With 500 values a dot plot becomes an unreadable wall of dots.
3. A histogram groups values, so it stays readable at any size and makes the overall shape obvious.
4. The trade is precision for clarity: you give up individual values to see the pattern.

If wrong: Claimed a histogram is simply better. Each is better for a different job and a different size of data set.

8. Two very different histograms of the same 28 values

REASONING

Answer: **They used different bin widths**

1. Bin width is chosen by whoever draws the histogram; it is not fixed by the data.
2. Narrow bins produce many short bars and show fine detail, which can look spiky.
3. Wide bins produce a few tall bars and a smooth shape, which can hide detail.
4. Both are honest displays of the same 28 values — they simply group them differently.
5. This is why a histogram should always state its bin width.

If wrong: Concluded one of them must be wrong. Different grouping is not an error, though it can be misleading if the width is not stated.

Quick answers for fast checking:

#	Level	Answer
1	fluency	28
2	fluency	10
3	fluency	4
4	application	14
5	application	14
6	reasoning	balanced halves, not symmetric
7	reasoning	values vs shape
8	reasoning	different bin widths

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Runs right after SP-04 so the ‘dot plots keep everything, histograms do not’ contrast is fresh.

Slide	~Time	Note
1/8	0:00	Frame it: when there is too much data to plot one dot at a time, group it.
2/8	1:00	Hook — poll the highest score. Do NOT resolve. Most of the room will say 99.
3/8	3:00	Build the histogram live. Emphasise equal widths — unequal bins make heights uncomparable.
4/8	5:00	WE1 — resolve the hook. Name the trade explicitly: counts kept, values discarded. Refer back to yesterday's dot plot.
5/8	7:30	WE2 — histogram versus bar graph. The reorder test is the sharpest way to make the distinction stick.
6/8	10:00	CFU — all-student response. Answer 25 students. Watch for 8, from reading a single bin.
7/8	12:00	

		Bin width as a decision. If you have time, redraw with two bins so they see the same data look different.
8/8	14:00	Launch the in-class practice sheet.