



Displaying data in dot plots

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 dot plot lesson. 5–8 min, independent. Item 3 is the one most often skipped in teaching and most often wrong on assessments.

Timing: 5–8 min · independent · grid or lined paper. A 5-dot answer on item 1 is the clearest possible signal.

1. Dot plot of the pet data — how many dots? **FLUENCY**

Answer: **10 dots**

1. One dot per student, and there are 10 students.
2. Stacks: 2 dots above 0, 4 above 1, 2 above 2, 1 above 3, 1 above 5.
3. $2 + 4 + 2 + 1 + 1 = 10$, which is a good check that nothing was dropped.

If wrong: Drew 5 dots, one per DIFFERENT value. A dot plot shows every observation, not every distinct answer.

2. Tallest stack, and what the height means **APPLICATION**

Answer: **The value 1, with 4 dots — four STUDENTS own one pet**

1. The stack above 1 is the tallest, 4 dots high.
2. Height = how many students gave that answer, i.e. the frequency.
3. So four students each own one pet. It does not mean anyone owns four pets.

If wrong: Said the tallest stack means ‘4 pets’. The height counts students; the position on the axis gives the number of pets.

3. Dots above 4? Should 4 be on the axis? APPLICATION

Answer: **0 dots, and yes — 4 must still appear**

1. No student reported 4 pets, so the stack above 4 is empty.
2. But 4 still belongs on the number line, because a number line is evenly spaced.
3. Leaving it out would pull 5 next to 3 and make the gap invisible.
4. That empty space is information: it shows the 5 is separated from the rest of the data.

If wrong: Left 4 off the axis so the dots sat side by side. That distorts the spacing and hides the outlier.

4. Median and mean; which is easier to see? REASONING

Answer: **Median 1, mean 1^5 — the MEDIAN is easier to see**

1. Median: ten values in order, average the 5th and 6th, both 1, so the median is 1.
2. Mean: sum 16, divide by 10 $\rightarrow 1\frac{6}{10} = 1^5$.
3. On the plot you can count inward from both ends to land on the median — it is a position, so the picture gives it directly.
4. The mean has to be calculated; nothing on the plot shows it.
5. The mean is larger because the single 5 stretches the data to the right.

If wrong: Reported the mean as 1 by reading the tallest stack. The tallest stack is the MODE, which happens to equal the median here but is a third, different measure.

Quick answers for fast checking:

#	Level	Answer
1	fluency	10 dots
2	application	value 1, 4 dots = 4 students
3	application	0 dots, 4 stays on the axis
4	reasoning	median 1, mean 1^5

Practice Worksheet — answer key

Use: During the lesson after the deck. Items 1–3 look trivial but catch the axis-label-as-count error. Item 7 is the reason dot plots are taught before histograms.

Timing: 15–25 min · pairs or independent · one plot drawn at the top, reused throughout. Circulate on 7 and 9.

1. Dots above 0? FLUENCY

Answer: **2**

1. Two students reported 0 pets.

If wrong: Answered 0, reading the axis label instead of counting dots.

2. Dots above 2? FLUENCY

Answer: **2**

1. Two students reported 2 pets.

If wrong: Answered 2 by coincidence without counting — check the reasoning, not just the number.

3. Dots above 5? FLUENCY

Answer: **1**

1. One student reported 5 pets.

If wrong: Answered 5, reading the axis label as the count.

4. Range? APPLICATION

Answer: **5**

1. Highest 5, lowest 0. Range = $5 - 0 = 5$.

If wrong: Counted the number of stacks (5) rather than subtracting. The match here is a coincidence.

5. Students with at least one pet? APPLICATION

Answer: **8**

1. Everyone except the two who reported 0.
2. $4 + 2 + 1 + 1 = 8$ students. Or $10 - 2 = 8$.

If wrong: Answered 4 by reading only the tallest stack. 'At least one' means every stack from 1 upward.

6. Students with two or more pets? APPLICATION

Answer: **4**

1. Stacks at 2, 3 and 5: $2 + 1 + 1 = 4$ students.

If wrong: Included the stack at 1, giving 8. 'Two or more' starts at 2.

7. Recover the original list from the plot REASONING

Answer: **0, 0, 1, 1, 1, 1, 2, 2, 3, 5**

1. Read each stack and write its value once per dot.
2. Two dots at 0 $\rightarrow$ 0, 0. Four dots at 1 $\rightarrow$ 1, 1, 1, 1. Two at 2 $\rightarrow$ 2, 2. One at 3 $\rightarrow$ 3. One at 5 $\rightarrow$ 5.
3. That is all ten values, in order.
4. A dot plot keeps EVERY individual value, which is why the original list can be rebuilt exactly.

If wrong: Wrote 0, 1, 2, 3, 5 — the distinct values only. That loses the frequencies and turns 10 observations into 5.

8. No dots at 4, one dot at 5 — what does the space mean? REASONING

Answer: **The 5 is separated from the rest of the data — it is an outlier**

1. The data runs 0, 1, 2, 3 with no gaps, then jumps to 5.
2. The empty column at 4 shows that separation visually.
3. That student owns noticeably more pets than anyone else, which is what makes 5 an outlier.
4. If 4 had been left off the axis, 3 and 5 would sit next to each other and the gap would be invisible.

If wrong: Said the space means the data is wrong or a value is missing. An empty position is a real finding, not an error.

9. 'The tallest stack shows the largest value' — refute it REASONING

Answer: **Wrong: the tallest stack is at 1, but the largest value is 5**

1. The tallest stack sits above the value 1, four dots high.
2. The largest value in the data is 5, whose stack is only one dot high.
3. So the tallest stack is not at the largest value — here it is at nearly the smallest.
4. The tallest stack shows the MOST COMMON value, the mode. Height means frequency, position means size.
5. In fact the tallest stack is often at a small value, because common answers cluster near the low end when there is a right tail.

If wrong: Agreed with the student because tall feels like big. Height and position measure different things and must be read separately.

Quick answers for fast checking:

#	Level	Answer
1	fluency	2
2	fluency	2
3	fluency	1
4	application	5
5	application	8
6	application	4
7	reasoning	0,0,1,1,1,1,2,2,3,5
8	reasoning	the 5 is an outlier
9	reasoning	tallest stack is the mode

Homework — answer key

Use: Parallels the practice sheet. Items 2 and 5 are a deliberate pair — one asks for a height, the other for a value, and students who confuse the two get exactly one wrong.

Timing: ~15 min at home · independent · review items 2 and 5 side by side as the next-day warm-up.

1. Observations from stacks 3, 4, 2, 2, 1? FLUENCY

Answer: 12

1. Add the stack heights: $3 + 4 + 2 + 2 + 1 = 12$.
2. Every dot is one observation.

If wrong: Answered 5 by counting the stacks rather than the dots.

2. Tallest stack? FLUENCY

Answer: 4

1. The largest stack height is 4.

If wrong: Gave the value the stack sits above instead of its height.

3. Shortest non-empty stack? FLUENCY

Answer: 1

1. The smallest non-zero height is 1.

If wrong: Answered 0 by counting an empty position.

4. Median of the pet data? APPLICATION

Answer: **1**

1. Ten values in order: 0, 0, 1, 1, 1, 1, 2, 2, 3, 5.
2. Average the 5th and 6th: both are 1, so the median is 1.
3. On the plot, count five dots in from each end; they meet in the stack above 1.

If wrong: Answered $2\frac{1}{2}$ by averaging the smallest and largest values. That is the midrange, not the median.

5. Mode, and how the plot shows it APPLICATION

Answer: **1 — it is the tallest stack**

1. The mode is the most common value.
2. On a dot plot the most common value has the most dots, so it is simply the tallest stack.
3. Here that is the value 1, with 4 dots.
4. No calculation is needed — the mode is the one summary a dot plot hands you by eye.

If wrong: Gave 4, the HEIGHT of the tallest stack, instead of the value it sits above.

6. How to check a dot plot is complete REASONING

Answer: **Count the dots — the total must equal the number of observations**

1. Add up every stack height.
2. That total must match how many people or things were measured.
3. For the pet data: $2 + 4 + 2 + 1 + 1 = 10$, and there were 10 students, so it is complete.
4. If the totals disagree, a dot was dropped or added — and this check works without the original list.

If wrong: Suggested checking that every value has a dot. Empty values are allowed and expected; the total is the real check.

7. Why one dot per observation, not per value? REASONING

Answer: **Because frequency would be lost, and with it the shape of the data**

1. One dot per distinct value would give 0, 1, 2, 3, 5 — five dots for ten students.
2. You could no longer tell that four students own one pet and only one owns three.
3. Center, spread and shape all depend on how many observations fall where.
4. With one dot per observation, the original list can be recovered exactly; with one per value, it cannot.

If wrong: Answered that it would look neater. Neatness is not the criterion — information is.

8. Why a one-dot stack can be the most interesting REASONING

Answer: **Because a lone dot far from the rest is an outlier, and outliers change your conclusions**

1. The single dot at 5 sits apart, with an empty position at 4 between it and the rest.
2. That one value pulls the mean up from 1 to 1^5 , while the median stays at 1.
3. Rarity is what makes it notable: it shows one student is unlike the others.
4. Small stacks tell you about the extremes and the spread; tall stacks tell you about the typical case. You need both.

If wrong: Said a single dot does not matter because it is only one student. One value can move the mean, set the range, and change which measure of center you should report.

Quick answers for fast checking:

#	Level	Answer
1	fluency	12
2	fluency	4
3	fluency	1
4	application	1
5	application	1
6	reasoning	total dots must equal n
7	reasoning	frequency would be lost
8	reasoning	a lone dot is an outlier

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. First of the three display skills. Slide 7 sets up the contrast that SP-05 depends on.

Slide	~Time	Note
1/8	0:00	Frame it: a dot plot is the simplest way to see a whole data set at once.
2/8	1:00	Hook — poll the number of dots. Do NOT resolve. Expect a chorus of ‘five’ from students counting distinct values.
3/8	3:00	State the rule, then build the plot live with student help so they see the fourth dot go on the 1.
4/8	5:30	WE1 — the height/position split. Say it twice; it is the error that persists into histograms and bar graphs.
5/8	7:30	WE2 — the empty position. Draw the plot with 4 removed so they SEE the outlier vanish, then put it back.
6/8	9:30	CFU — all-student response. Answer 4 students. Watch for 8, from including the stack at 1.
7/8	11:30	Rebuild the list aloud. Flag explicitly that histograms will NOT let you do this — that contrast is the point of SP-05.
8/8	13:30	Launch the in-class practice sheet.