

PSYCH 10 · Fall 2026 · Worksheet for Lecture 3: Distributions & histograms · Answer key

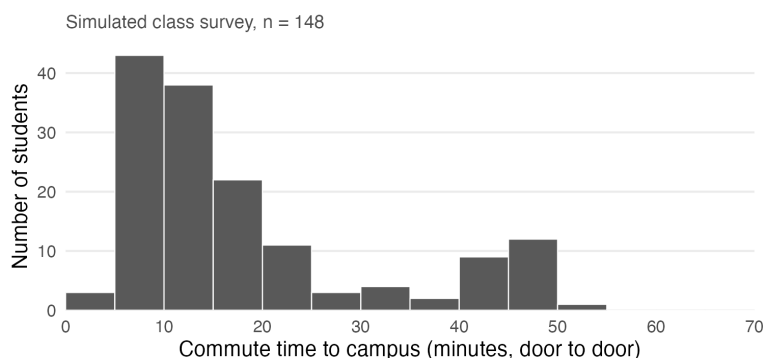
The answers are in blue. Where a question has more than one defensible answer, the key says so and describes what a good answer contains.

Part 1 · The Challenger data

The table on the screen lists every shuttle launch before Challenger, with the temperature at launch and how much damage the O-rings showed afterward. The forecast for launch morning was 26–29°F. **Sketch the graph you would have drawn** to make the case for postponing. Label both axes.

A scatter plot with the temperature at launch on the horizontal axis and the amount of O-ring damage on the vertical axis, one point per launch, including the launches with no damage. Drawn that way, the damaged launches cluster at the cold end, nothing was ever launched below 53°F, and the forecast of 26–29°F falls far to the left of every point ever recorded, which is the case for postponing. A plot that leaves out the launches with zero damage, as the engineers' table did, hides the pattern.

Part 2 · Reading a histogram



- a. Describe the **shape** of this distribution in one sentence (start with “roughly...”). Where is the bulk of the data?
- b. About how many students have a commute of **40–45 minutes**? How wide are the bins? Does the bar at 40 include a 40-minute commute or a 45-minute one? (If you can't tell from the graph, say so.)
- a. *Roughly right-skewed: the bulk of the commutes is between about 5 and 20 minutes, with the peak in the 5–15 range (the tallest bars are 5–10 and 10–15) and a long tail to the right, plus a small second bump near 45 minutes. “Roughly bimodal” is a fair description as well, as long as the big peak and the small bump both get a mention. The skew takes its name from the side the tail is on, the right, and not from the location of the peak.*
- b. *Reading the height of the bar at 40: about 9 students. The bins are 5 minutes wide, since the bars sit at 0, 5, 10, and so on. Whether a commute of exactly 40 or exactly 45 minutes is counted in that bar can't be told from the picture; the software made that choice, and it isn't printed anywhere on the graph, so “you can't tell” is the accurate answer. (In this figure, a 45-minute commute is counted in the 40–45 bar and a 40-minute one in the 35–40 bar.)*

Same 148 students. **If we redraw the histogram with 10-minute bins instead of 5, what will it look like?** Sketch it. Is the second bump still there?

With 10-minute bins the histogram has half as many bars, and each bar is roughly the sum of two of the old ones: a bar of about 46 students at 0–10, the tallest bar at 10–20 (about 60), then bars that shrink quickly through 20–30 (about 14) and 30–40 (about 6), and one taller bar at 40–50 (about 21) before the tail. The second bump is still there, as one bar that stands above its neighbors on both sides, though it is less distinct than in the 5-minute version; with 20-minute bins it would nearly vanish, a 40–60 bar of about 22 next to a 20–40 bar of about 20.

Part 3 · The second bump

Look again at the histogram. Besides the peak near 10–15 minutes, **there is a second bump around 45 minutes.**

- a. List **three different processes** that could have produced that second bump. Make them different from one another, not variations on one explanation.
- b. Circle the one you find most plausible.
- c. Pick one of the others. What data, existing or new, would help you tell that process apart from the one you circled?
1. *A second group of students inside the same survey: people who live somewhere with a route of about 45 minutes (a shuttle or train line), so the sample mixes two different commuting processes.*
 2. *A measurement difference: some students answered with a round trip instead of one way (a 22-minute commute doubled is 44), or rounded their answer to "about 45."*
 3. *The set of people surveyed: the survey went out in a section or a dorm that draws commuters, so the bump describes the respondents rather than all students. Chance is a fourth candidate, since with 148 students and 5-minute bins a ragged histogram is normal, though a bump of about 20 students is more than the usual lumpiness of a sample.*
- c. *Any one can be circled with a reason. To separate a second group from a measurement difference: add a question about where students live, which would show whether the 45-minute students share a route; ask "one way or round trip?"; or look at last year's survey, where a real second group would appear again while a measurement slip would probably be absent from it.*

What is something new you learned today?

(Your own answer.)