

PSYCH 10 · Fall 2026 · Worksheet for Lecture 5: The mean as a model · 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.

Warm-up. In 1535, a German surveyor's manual gave this recipe for the rod, the unit used to measure fields. Stop sixteen men as they come out of church, tall ones and short ones, and have them line up their left feet toe to heel. That length is the rod, and one sixteenth of it is a foot. **Why sixteen men instead of one? And what kind of error would remain in a rod made from sixteen feet?**

Sixteen men instead of one because one man's foot can be unusually long or short, while sixteen feet laid end to end let the long ones and the short ones partly cancel out, so a sixteenth of the total comes out close to a typical foot, which is the definition of a mean. What sixteen feet wouldn't fix is a difference shared by all sixteen men: if the men who happened to come out of church were all tall, every foot would be long and the rod would be too long as a result.

Part 1 · Seven salaries

Here are the salaries of the seven teachers at one school, in thousands of dollars: **32, 35, 38, 41, 44, 52, 94**.

- Find the median and the mean. (The mean is a whole number.)
 - Suppose the teachers' union and the school's budget office each want to report one number as the typical salary at this school. Which number would each of them pick, and why?
 - For each teacher, compute the deviation from the mean (the salary minus the mean), keeping the sign. Then add up all seven deviations.
 - Now suppose someone proposed 45 as the model instead of the mean. Compute the seven deviations from 45 and add them up. How is this sum related to the distance between 45 and the mean? Use that relationship to predict what the sum of the deviations from 50 would be, without computing them.
 - (If you have time.) The teacher who earns 94 leaves, and a new teacher who earns 31 is hired. Write the seven new salaries in order, then find the new median and the new mean. Which one changed more, and why?
- a. *The median is 41 (the fourth of the seven salaries in order) and the mean is $336/7 = 48$.*
- b. *The union would most likely report the median, 41, since it describes what a teacher in the middle of the list earns and the one large salary has no effect on the middle value; the budget office would most likely report the mean, 48, since it is the total pay bill divided by seven, which is what the school spends per teacher. Both numbers are correct, and either choice is defensible with a reason; what matters is naming the one in the report.*
- c. *16, 13, 10, 7, 4, +4, +46, which add up to 0: the five below the mean add to 50 and the two above it add to +50.*
- d. *The deviations from 45 are 13, 10, 7, 4, 1, +7, +49, which add up to +21. Each of them is 3 larger than the corresponding deviation from the mean, because 45 is 3 below the mean, and $7 \cdot 3 = 21$. So for 50, which is 2 above the mean, each deviation is 2 smaller than its deviation from the mean, and the sum is $7 \cdot (-2) = -14$, with no need to compute the seven.*
- e. *The new salaries in order are 31, 32, 35, 38, 41, 44, 52. The median moves from 41 to 38 and the mean from 48 to 39 ($273/7$), so the mean moved by the larger amount. Every salary contributes a seventh of itself to the mean, so replacing 94 with 31 lowers the mean by $63/7 = 9$, while the median can only move to a neighboring value in the sorted list.*

Part 2 · Seven averages

Each of the statements below uses an average. Next to each one, write **A** if the average is a useful summary, **B** if it is a number you can compute but one that is easy to misread, or **C** if it is not meaningful.

- ____ The average American household has 2.5 people.
- ____ My roommate got home at 11 pm, midnight, and 1 am this week, so on average they got home at 8 am.
- ____ The average zip code of the students in this class is 94305.
- ____ A restaurant's average rating on Yelp is 4.2 stars.

5. ____ The average adult has fewer than two legs.
6. ____ The center of the US population, the average location of all 330 million residents, is in Missouri.
7. ____ You drove to a friend's place at 30 mph and back along the same road at 60 mph, so your average speed for the round trip was 45 mph.

a. Pick one of the statements you marked B or C. In one sentence, say what goes wrong and what you would report instead.

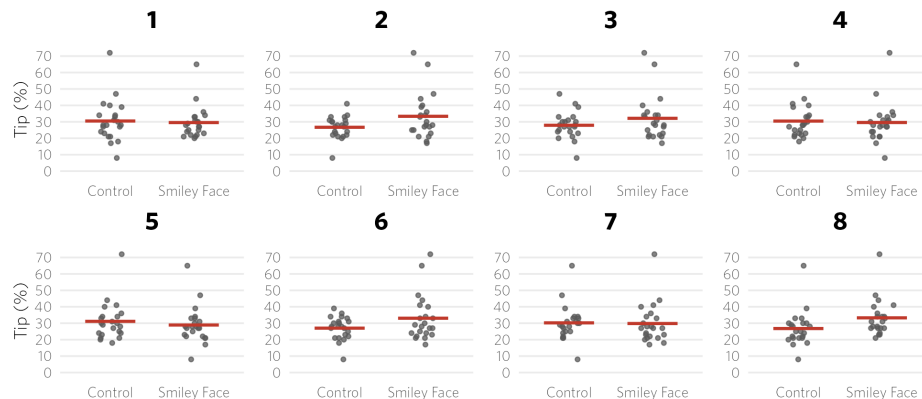
b. Give one example of your own of an average of something that isn't a number, and say what that average would be good for.

The letters, with the reasons. 1, A: no household has 2.5 people, but the number is the total number of people divided by the number of households, and a city expecting 10,000 new households can use it to plan for about 25,000 people. 2, B (or C, with the same reasoning): the 8 am comes from counting hours from midnight, $(23 + 0 + 1)/3 = 8$, and counted from noon the same three times average to midnight; clock times wrap around, so a plain mean depends on the starting point of the count. 3, C: zip codes are labels rather than amounts, so their mean is a number with no meaning, and the most common zip code is the summary with a meaning. 4, B: stars are an ordered scale rather than amounts, and a 4.2 could be mostly 4s and 5s or a mix of 1s and 5s, from two reviews or two thousand. 5, B: true, since a few people have fewer than two legs, so the mean is a little under 2 and nearly everyone is above average, and the most common value, 2, is the number that describes the group. 6, A: the mean of 330 million locations is itself a location, the point where a map would balance with one weight per resident; the Census Bureau computes it after each census, and it has moved west and south since 1790. 7, B: average speed is total distance divided by total time, and 30 miles out at 30 mph takes an hour while 30 miles back at 60 mph takes half an hour, so 60 miles in 1.5 hours is 40 mph, because the slow half took twice the time.

a. Any of the statements marked B or C, with what goes wrong and what to report instead, as above.

b. Any average of something that isn't a number, with a use for that average: a composite photograph (the average face of a group); the average color of a photo (the color shown in an image's place before the image itself); the center of population (where to put a service that should be close to everyone). "The average student is a sophomore" is a most common value rather than a mean, and that distinction is worth a mention.

Part 3 · Which one is real?



One of these eight plots shows the real data from the tipping experiment: 44 restaurant tables, 22 of which got a check with a smiley face drawn on it and 22 of which (labeled Control) got a plain check. The thick bar in each group is the group's mean tip. In the other seven plots, the same 44 tips were reassigned to the two groups at random.

a. Circle the number of the plot you think is the real one.

b. In one sentence, explain what made you pick that plot.

a. *Panel 6 is the real one.*

b. *Any reason is a good answer here, because the point of the exercise is that no feature of the plots reliably picks out the real panel: the real difference (33% against 27%, about 6 points) is about the same size as the differences the random reassignments produce, and in panels 2 and 8 the shuffled difference is larger than the real one. So these 44 tables don't*

give strong evidence that the smiley face raised tips, and a reason such as "the biggest gap between the two bars" would have picked one of the shuffles.