Chapter 8 – Generalization, Analogy, and Causation
Answers to select "Getting familiar with…" exercises.

Getting familiar with… inductive generalization.

A. Complete each of the following inductive generalizations by supplying the conclusion.

1.
1. Almost all politicians lie.
2. Blake is a politician.
3. Hence, **Blake very likely lies.**

3.
1. You haven't liked anything you've tried at that restaurant.
2. Therefore, this time **you probably won't like anything you've tried.**

5.
1. In the first experiment, sugar turned black when heated.
2. In experiments two through fifty, sugar turned black when heated.
3. Therefore, probably **the next bit of sugar we heat will turn black.**

7.
1. Every time you have pulled the lever on the slot machine, you've lost.
2. So, **the next time you pull the lever you are likely to lose.**

9.
1. Every girl I met at the bar last night snubbed me.
2. Every girl I met at the bar so far tonight has snubbed me.
3. Therefore, **the next girl I meet will snub me.**

B. For each of the following examples, explain a way the method of data collecting could undermine the strength of an inductive generalization. There is more than one problem with some examples.

1. Marvin county schools offered any child who is interested the opportunity to change schools to a school with a new curriculum in order to test the effectiveness of the new curriculum.

It is possible that only children who are already motivated to succeed academically will participate. This means the sample will likely be biased by those who choose to participate. Because these are high-achieving students, the program will look like a success even if it doesn't actually work. (Note. This is a common type of bias called "self-selection bias." Self-selection bias occurs when the sample selects itself, very likely resulting in a non-random distribution.)

3. To find out what typical Americans think of the current political climate, 785 college students were polled from a variety of campuses all over the United States.

The sample is biased by the demographic. It is not obvious that the political views of college students represent the political views of "typical Americans."

This sampling method's validity is also suspicious. What do the surveyors mean by "current political climate"? Is there something specific they want to know? And what do the surveyors mean by what people "think" about that climate? Do they want specific criticisms or compliments?

5. To find out how well Georgians think the Georgia governor is doing in office, researchers polled 90% of the population of the largely Republican Rabun County.

This sample could be biased by the distribution of political parties. If Rabun County's demographic were representative of the distribution of Georgia's political parties, then the polling results might be unbiased. But if Georgia as a whole is not largely Republican, the sample is very likely biased.

7. Tameeka says, "I've known two people who have visited Europe, and they both say that Europeans hate Americans. It seems that people outside the U.S. do not like us."

This sample is not proportionate. Two people's experiences with Europeans is not enough to draw a conclusion about what all Europeans think of American.

Also, the survey is invalid. We don't know what it was about those Europeans that led them to think Europeans hate Americans. Were they treated poorly? Did those Europeans say they do not like Americans or American tourists or American politics or American education, etc.? Is it possible that those two people were acting in an obnoxious way, which made the Europeans they encountered more hostile than they might have been?

9. A survey question asks, "Given the numerous gun-related accidents and homicides, and the recent horrifying school shootings, are you in favor of more gun regulation?"

This sampling method is invalid. It frames the question (framing bias) in a leading way. The answers are more likely to reflect the respondents' emotional reactions to accidents, homicides, and "horrifying" school shootings than to the effectiveness of gun regulation.

Getting familiar with… errors in statistics and probability.

For each of the following, explain which probability error has been committed.

1. “Every time I take this new VitaMix cold medicine, my cold goes away. Therefore, I know it works.”

This person is committing the base rate fallacy. Colds go away on their own. Even if this person took no medication, the results would be the same. So, why think VitaMix played some causal role in its going away? To know whether VitaMix helped in this respect, we would need to compare it to cases with different outcomes. For instance, did the cold go away more quickly than normal? To answer this, we would need to know the base rate duration of colds, and then we would need to compare this to many people who took VitaMix at a particular point during their cold (if some took it at the beginning and some took it near the end, our results will not be informative).

3. “Every time I leave the house without an umbrella, it rains. Why me!?”

(This is also an example of something called a “hedonic asymmetry.”
We pay more attention to events that cause emotional response—positive or negative—than to events that don’t. So, even though the number of times it rains when you don’t take an umbrella may be roughly equal to the times it rains when you do, you tend to remember the times you don’t more vividly because they cause a strong emotional response.)

This person is committing the base rate fallacy by ignoring the number of times she left the house when it wasn’t raining and the number of times she left with her umbrella and it was raining. Because of the hedonic asymmetry, she focuses on those times when forgetting her umbrella stands out in her memory, namely, when it rains. Without comparing the number of times she remembered her umbrella and it rained and the number of times she didn’t take her umbrella and it didn’t rain, we have no idea whether it only rains when she goes out without an umbrella.

5. After watching Kareem win three tennis sets in a row, the recruiter is sure that Kareem will be a good fit for his all-star team.

This is an instance of the regression fallacy. By definition, few people are exceptional and few people are deplorable. People who excel in one case often do more poorly in subsequent cases. People who are deplorable in one case often do better in subsequent cases. Therefore, three exceptional plays in a row may indicate an exceptional tennis player, or they may indicate a lucky streak. One cannot reliably conclude from these three wins that Kareem will continue to win.

7. After acing her first exam, Simone was shocked to discover that she only got an 85 on the second. She concludes that she must be getting dumber.

Regression fallacy

9. “Ever since I bought this mosquito repellent, I haven’t been bitten by one mosquito. It must really work.”

We often reason this way, and it isn’t obviously erroneous. The goal of this example is to get you think about a way in which the inference doesn’t work. Notice how this could be an example of the base rate fallacy. If the person had been bitten regularly by mosquitoes and then, after using mosquito repellent, stopped getting bitten, then the repellent likely works. But if he was only bitten infrequently, then noticing he hasn’t been bitten after buying the repellent may not indicate anything about the repellent’s effectiveness. Alternatively, imagine he was getting bitten regularly in the Everglades National Park, buys the repellent, and then immediately flies back to his home state of New York. The drop in mosquito bites is a function of the base rate of getting bitten in New York as opposed to the base rate of getting bitten in the Everglades.

Getting familiar with… arguments from analogy.

1.
1. Bear paw prints have five toe marks, five claw marks, and an oblong-shaped pad mark.
2. This paw print has five toe marks, five claw marks, and an oblong-shaped pad mark.
3. Thus, **this paw print was likely made by a bear.**

3.
1. The jeans I’m wearing are Gap brand, they are “classic fit,” they were made in Indonesia, and they fit great.
2. This pair of jeans are Gap brand, “classic fit,” and were made in Indonesia.
3. Therefore, **they probably fit great.**

5.
1. At the first crime scene, the door was kicked in and a playing card was left on the victim.
2. At this crime scene, the door was kicked in and there is a playing card on the victim.
3. Therefore, **the person who committed this crime is likely the same person who committed the last crime.**

7. Everything I have read about this pickup truck tells me it is reliable and comfortable. There is a red one at the dealer. I want it because **it will likely be reliable and comfortable.**

9. This plant looks just like the edible plant in this guidebook. Therefore, **this plant is probably the same type of plant that is mentioned in the guidebook.**

Getting familiar with… causal arguments.

A. Complete each of the following arguments by supplying a causal claim for the conclusion.

1.

1. I have released this pen 750 times.
2. Every time, it has fallen to the floor.
3. Thus, **something causes this pen to fall to the floor.**

3.

1. In the past, when I thought about raising my arm, it raised.
2. So, **thinking about raising my arm probably causes my arm to raise.**

5.

1. The label says gingko biloba increases energy.
2. I have taken gingko biloba every day for two months.
3. I notice no increase in energy.
4. Thus, **gingko biloba probably does not increase energy.**

B. Explain whether each of the following is a causal argument or an explanation.

1. The window is broken, and there is a baseball in the pile of glass. Therefore, the baseball probably broke the window.

This one is a bit subtle, and it depends on understanding what question is at stake. We have a conclusion indicating word (therefore), which suggests it is an argument. But here is a way to think through it:

One question might be, "What happened in this room?" or "What was that noise?" An *explanation* would be that a baseball broke a window. Another question might be, "What broke the window?" or "Did that baseball break the window?" An *argument* would involve citing evidence of a baseball's proximity to the broken glass. In this case, its location (in the pile of glass) is evidence that the baseball was the cause.

This could be an argument or an explanation depending on what question is being asked. But notice that the second question already assumes the glass is broken, yet the author mentions that the glass is broken as if it were new information. This suggests that the most likely interpretation is that this is an explanation.

3. The sun rises every morning because the Earth rotates on its axis once every twenty-four hours. As it turns toward the sun, we experience what we colloquially call "the sun's rising."

This is an explanation. None of the claims are intended the increase the likelihood of any of the others. The author is telling us what we are experiencing when we say "the sun is rising."

5. He ran off the road because the cold medicine made him drowsy. Running off the road caused him to hit the lamppost. The lamppost caused the head trauma. Thus, driving while on cold medicine can lead to serious injuries.

This is an explanation. It is an answer to question like, "What happened?" or "How did he get those injuries?" None of the claims are intended the increase the likelihood of any of the others. The author is telling us how this man sustained his injuries.

C. Explain the mistaken identification of causation in each of the following examples. Give an explanation of what might really be happening.

1. "I flipped five tails in a row. That's highly improbable! The universe must be telling me I need to go to Vegas."

Mistaking coincidence for causation. Five heads are improbable, but they do happen naturally from time to time. What is probably happening is that the person is committing the base rate fallacy. He is assuming that a run of five heads is so rare that it must be miraculous. But this ignores the rare base rate, and assumes there are no times, outside of the causal hand of fate or destiny or the gods, that such things happen.

3. "There is a strong positive correlation between being poor and being obese. This tells us that poverty causes obesity."

Mistaking correlation for causation. Although the results are correlated, it is unclear what the cause of this correlation might be. Perhaps there is a third event

that serves as a common cause to both. Perhaps obesity causes poverty. Perhaps this is only one experiment and the results are purely coincidental, not to be reproduced in subsequent trials.

5. “I see the same woman in the elevator every morning. And we take the same bus into town. Fate must be trying to put us together.”

Mistaking coincidence for causation. Even though “every morning” is mentioned, this is not a mistake in temporal order. The events occur at the same time. And given that our arguer seems astute enough not to think that arriving at the station causes the woman to show up, it is not likely to be mistaking correlation for causation; he or she is thinking in terms of a common cause.

But the common cause cited is “fate” (a remnant of the ancient Greek belief in the Fates (*morai*), which directed the destinies of both gods and humans). Is this the most plausible common cause? The mistake is likely a simple misassignment of the cause (see also false cause fallacy, Ch. 10). The coincidence does not allow us to draw a strong inference about the common cause. It could be that both people live in the same building and have jobs during normal business hours. These are coincidences. It could be that she is stalking our arguer (which is a bit creepy), which is not mere coincidence, but neither is it a happy conclusion. The author seems arbitrarily to choose fate as the cause, but this is unjustified by the evidence.