

Practice Midterm - C79, Spring 2013

February 28, 2013

1. A fair coin is to be tossed, and a fair die is to be rolled, independently.
 - (a) What is the chance that the die lands showing 3 or more spots on top?
 - (b) What is the chance that the coin lands heads or the die lands showing 3 or more spots on top?
2. On the first day of class, Prof. Wagner talked about the reliability of 2-engine and 4-engine jet aircraft. It turned out that (setting aside whether pilots of one type take greater risks than pilots of the other type) the reliability is essentially the same. Ignoring the complexity of having four engines rather than two, and assuming that either type of aircraft can fly if even one engine still works, how do you account for the fact that the redundancy of two more engines does not measurably improve reliability?
3. An administrator at a local university used historical employment records to show that Deans of Schools and Colleges have somewhat longer lifetimes than regular faculty. What is a reasonable interpretation of this finding?
4. States that tend to have the highest fraction of African-American voters also tend to vote more Republican. Why does this not mean that African Americans tend to be more likely to vote Republican?
5. You ride the bus (AC Transit) to campus and use a smart phone application (NextBus) that reports the estimated arrival time of the bus to your stop. According to AC Transit's statistics, 10% of buses are late to stops. Based on user data collected from NextBus, 80% of the time when the bus is actually on time to your stop, the application reported that the bus would be on time. Additionally, 10% of the time when the bus is actually late to your stop, the smart phone application reported that it would be on time. On a randomly chosen day, you are at home and want to get to campus. You open up NextBus on your smart phone and see that the bus will arrive at your stop on-time. Given that NextBus reported that the bus would arrive at your stop on-time, what is the probability that it is actually on-time?

6. You are a clumsy Berkeley student and are worried that you will somehow accidentally damage (i.e., drop) the new expensive smart phone that you recently purchased. You use the phone all the time when you ride the bus to campus and also when you are walking around. You are considering whether or not to buy an insurance plan for your cell phone. You looked online, and a news article that you read tells you that buying cell phone insurance is generally not a good idea. The news article cites a statistic from a nationwide survey, which showed that only a small fraction of cell phones are ever damaged. Do you find the news article convincing? Briefly describe what information you would need or how you would make the decision to purchase cell phone insurance.
7. Briefly explain why it is difficult to make causal inferences from observational studies. How do controlled experiments address some of these issues?
8. What is the representativeness heuristic? Describe two judgment biases that result from use of this heuristic. For each one, explain why it is a bias and how representativeness can account for it.
9. I'm deciding whether I should move to country B to find a job. Assuming that job assignments are like coin tosses. Assume I will land a job at my homeland with 90% probability with an annual salary of \$20,000. If I do not get a job I'll receive \$6,000 in unemployment benefits. Finding a job in country B only has a chance of 30% of finding a job for an immigrant and there are no unemployment benefits. Moreover, moving to country B will cost \$5,000. Assuming I'm risk neutral (i.e. I care only about my expected income), what's the minimum annual salary I should expect in country B to be indifferent between staying home or moving to country B?
10. The correlation between income and voting for President Obama in California is negative as measured in individual-level survey data. In California, the correlation between the average vote for President Obama in voting precincts and the average income of those precincts is also negative. However, the correlation between the average vote for President Obama in California's 58 counties and the average income of those counties is positive. What explains the change from negative to a positive correlation?