Econ 57
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Midterm Answers

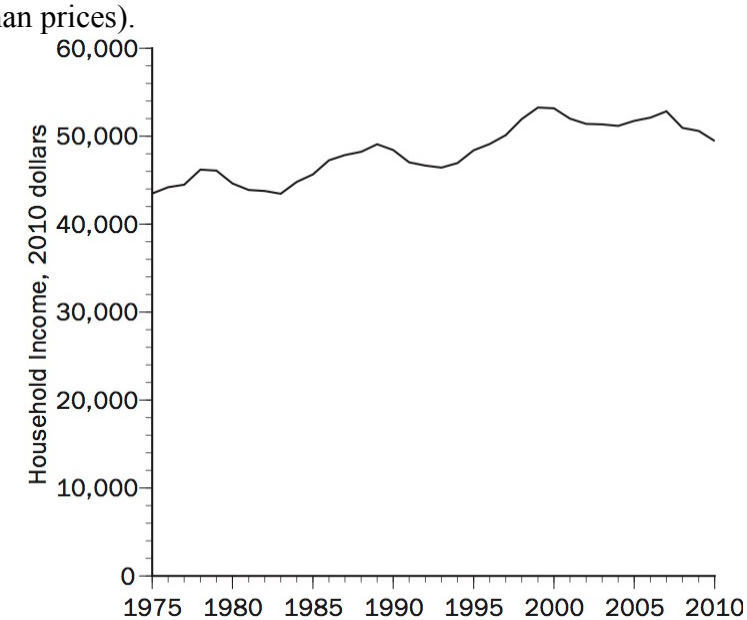
1. People who visited more than once for pleasure are likely to have enjoyed their visits. The survey excludes those who never went or went once and never came back.

2. The success probability is 0.99. Assuming independence, the probability of 25 successes in 25 missions is $0.99^{25} = 0.7778$.

3. There is survivor bias in that the planes that were shot down, perhaps because of damage to their cockpits, engines, or fuel tanks, are excluded from the study.

4. They evidently calculated the probability that, when there is an Elvis sighting, it will be east of the Mississippi before 2 p.m. The question asks the reverse conditional probability: if you are east of the Mississippi before 2 p.m., what is the probability of spotting Elvis? There is not enough information to answer that question.

5. The figure uses a narrow range for the income axis and a wide range for the CPI axis to make the growth in income appear larger than the increase in prices. Looking at the numbers on the axes, it seems that both income and the CPI have increased by a factor of 4, so income has not increased substantially more than prices. The figure below uses the CPI data to calculate real income in 2010 dollars, and shows that, adjusted for inflation, median household income has increased modestly over this 35-year period (income has increased a bit more than prices).



6. One way to think about this is to consider the binomial standard deviations:

$$S[X] = \sqrt{\pi(1-\pi)n}$$

$$S\left[\frac{X}{n}\right] = \sqrt{\frac{\pi(1-\pi)}{n}}$$

Since the success probability is 0.40 for B and 0.60 for S, the standard deviations only differ because of the number of trials, 25,000 and 10,000. For B, with the larger number of trials, there is a higher standard

deviation in the number of students choosing to attend and a smaller standard deviation in the fraction of the accepted students choosing to attend. Therefore, S has a better chance of being within 100 students, B has a better chance of being within 1 percent.

The actual probabilities are

	within 100	within 1%
B	0.801	0.801
S	0.957	0.775

7. The probability goes up to 1/2 if you use this strategy: Look at the first piece of paper and then discard it. Draw a second slip; if it is larger than the first slip, choose it; otherwise, choose the third slip.
Suppose that the highest number is on Slip 1, the second highest on Slip 2, and the lowest number is on Slip 3. Here are the possibilities.
   There is a 1/3 probability that you choose Slip 1 first, discard it, and lose.
   There is a 1/3 probability that you choose Slip 2 first. Half of these times, you will choose Slip 1 next, keep it, and win. The other half of the time, you chose Slip 3 second, discard it, and win.
   There is a 1/3 probability that you choose Slip 3. Half of these times, you choose Slip 1 next, keep it, and win; the other half of the time, you choose slip 2 next, keep it and lose.
The probability of winning is 1/3 + 1/3(1/2) = 1/2

8. The conclusion relates to a comparison of the probability of an accident if a person wears dark clothes or light clothes, but the statistics refer to the reverse probability—the probability that someone involved in an accident is wearing dark clothes. Suppose a contingency table looks like this:

	Accident	No Accident	Total
Dark Clothes	80	820	900
Light Clothes	20	80	100
Total	100	900	1000

Eighty percent of those involved in accidents are wearing dark clothes, yet the probability of being involved in an accident are 80/900 = 0.089 for those wearing dark clothes and 20/100 = 0.20 for those wearing light clothes. This counter-intuitive result occurred because I assumed that more than 80 of the pedestrians wear dark clothes.

9. It seems that these are the life expectancies of 400 people, but they are the age of the oldest person they know, not a typical person, let alone themselves. Plus, especially in a small town, they may know similar people. Imagine that one person is 110 and everyone in the town knows her. There would be 400 stickers at 110. Finally, the ad doesn't address the question of living longer at all because there are no data for earlier years.

10. People who are near death are often placed in beds, but it isn't the bed that kills them.