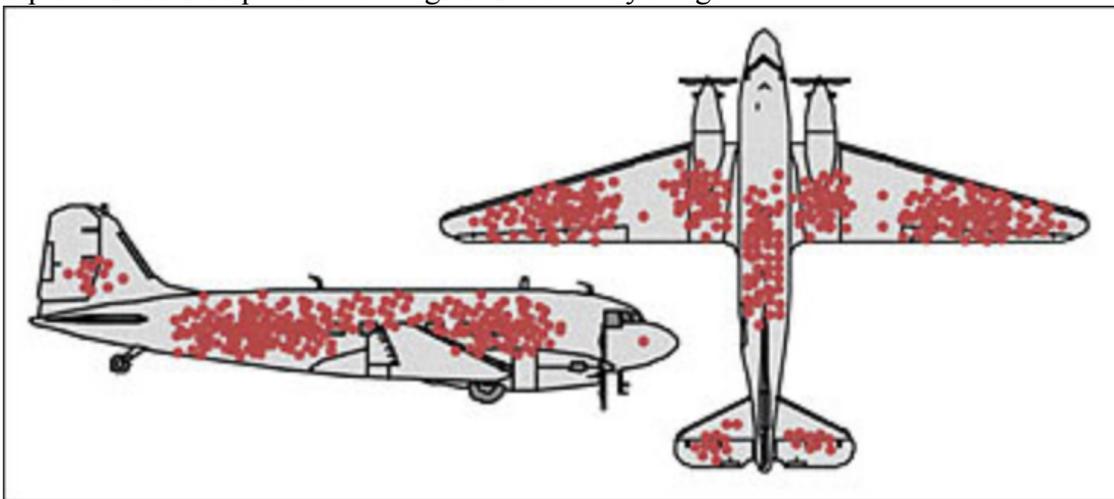


Midterm (75 minutes)

No calculators allowed. Just set up your answers, for example,  $P = 49/52$ . BE SURE TO EXPLAIN YOUR REASONING. If you want extra time, you can buy time at a price of 1 point a minute; for example, if your test is handed in 10 minutes after the scheduled finish time, 10 points will be subtracted from your test score.

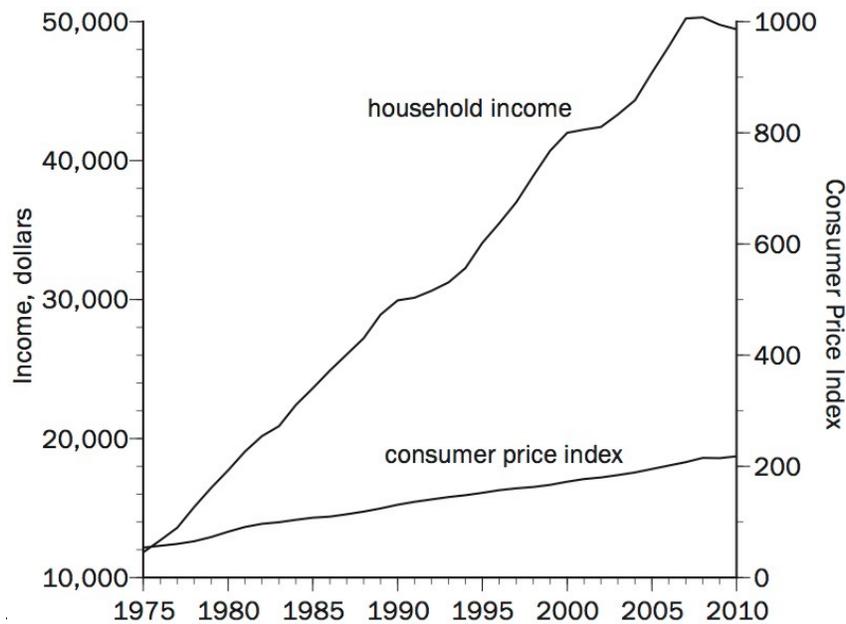
1. American Express and the French tourist office sponsored a survey that found that most visitors to France do not consider the French to be especially unfriendly. The sample consisted of “1,000 Americans who have visited France more than once for pleasure over the past two years.” Why is this survey biased?
2. Before the fatal 1986 explosion of the Challenger space shuttle, many government officials believed that the space shuttle program would never have a fatal accident. Within NASA, estimates of the probability of a mission failure ranged from 1 in 100,000 (by management) to 1 in 100 (by engineers). On other U.S. rockets, failure rates ranged from 1 percent (Thor) to 10 percent (Atlas). The tragic Challenger explosion came on its twenty-sixth mission. What is the probability of 25 successes in 25 missions if the probability of failure on each mission is 1 percent?
3. In World War II. The British Royal Air Force (RAF) planned to attach heavy plating to its airplanes to protect them from German fighter planes and land-based anti-aircraft guns. The protective plates weighed too much to cover an entire plane, so the RAF collected data on the location of bullet and shrapnel holes on planes that returned from bombing runs. The figure below is a stylized representation, showing most holes on the wings and rear of the plane, and very few on the cockpit, engines, or fuel tanks—suggesting that the protective plates should be put on the wings and rear. Do you agree?



4. The National Society of Professional Engineers used the following sample question to promote their national junior-high-school math contest. Explain how this group calculated their answer, 20.35 percent, and why it is wrong.

*According to the Elvis Institute, 45% of Elvis sightings are made west of the Mississippi, and 63% of sightings are made after 2 p.m. What are the odds of spotting Elvis east of the Mississippi before 2 p.m.?*

5. U. S. data for 1975 through 2010 on U.S. median household income and the consumer price index (CPI) are graphed below, using two vertical axes—one for income and the other for the CPI. Explain why you either agree or disagree that household income has increased much more than the consumer price index (CPI).



6. College B wants an entering class of 10,000 students; College S wants an entering class of 6,000 students. Each student accepted by B has a .40 probability of attending; each student accepted by S has a 0.60 probability of attending. If B accepts 25,000 students and S accepts 10,000 students, which college has a better chance of
- Getting exactly the desired class size, 10,000 for B and 6,000 for S?
  - being within 100 students of its desired entering class, 10,000 for B and 6,000 for S?
  - Being within 1 percentage point of its desired acceptance frequency, 0.40 for B and 0.60 for S?

Do NOT do any calculations. Just use logic and explain your reasoning.

7. Answer this Car Talk Puzzler:

*RAY: Three different numbers are chosen at random, and one is written on each of three slips of paper. The slips are then placed face down on the table. The objective is to choose the slip upon which is written the largest number.*

*Here are the rules: You can turn over any slip of paper and look at the amount written on it. If for any reason you think this is the largest, you're done; you keep it. Otherwise you discard it and turn over a second slip. Again, if you think this is the one with the biggest number, you keep that one and the game is over. If you don't, you discard that one too.*

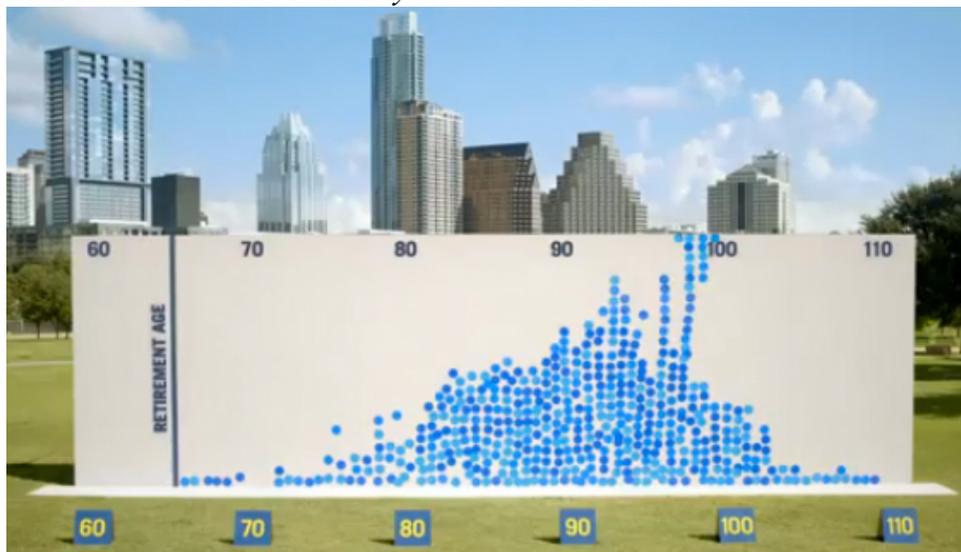
*TOM: And you're stuck with the third. I get it.*

*RAY: The chance of getting the highest number is one in three. Or is it? Is there a strategy by which you can improve the odds?*

8. Use some specific hypothetical numbers to explain why these data do not necessarily justify this conclusion by the magazine *California Highways*:

*A large metropolitan police department made a check of the clothing worn by pedestrians killed in traffic at night. About four-fifths of the victims were wearing dark clothes and one-fifth light-colored garments. This study points up the rule that pedestrians are less likely to encounter traffic mishaps at night if they wear or carry something white after dark so that drivers can see them more easily.*

9. Why is this Prudential Financial advertisement titled, “Let’s get ready for a longer retirement.” misleading? *A typical American city. 400 people. And a fascinating experiment. We asked everyday people to show us the age of the oldest person they know by placing a sticker on our chart. Living proof that we are living longer. Which means we need more money to live in retirement.*



10. “The most dangerous place to be is in bed, since more people die in bed than anywhere else.” Do you agree?