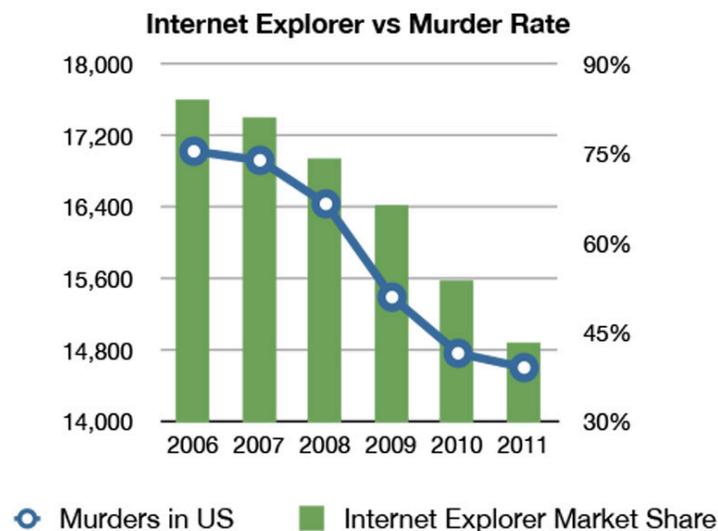


Midterm (75 minutes)

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. How was the author of this figure able to make it seem that Internet Explorer's declining market share had reduced the number of murders in the United States during this five-year period? What could he/she have done differently to make it seem that they were essentially unrelated?



2. A study of 20,072 emergency room admissions at a UK hospital found that patients who were admitted on public holidays were 48% more likely to die within 7 days than were patients admitted on other days. One interpretation of these results is that the doctors who work in emergency rooms on public holidays are less qualified and should be avoided. Provide another interpretation.
3. Explain why you agree or disagree with this claim by Edward Lazarus, a partner in the Washington polling firm of Information Associates: “a randomly selected sample would be in every way representative of the population at large because every individual in the universe has an equal probability of being picked. If that holds true, your attitudes, demographics, geography will be represented proportionately in the sample.”

4. Suppose that 50-year-old women fall into two categories based on their health: 80% are low-risk; 20% high-risk. The probability of dying within a year are 0.003 for low-risk women and 0.006 for high-risk women. If a woman dies between the age of 50 and 51, what is the probability she was in the high-risk group?

5. Use the information in the preceding question to answer this question. Suppose that a company sells a randomly selected 50-year-old woman a 1-year life insurance policy for \$5,000 that will pay either \$1,000,000 or nothing, depending on whether the women dies within a year.
 - a. For a high-risk woman, is the expected value of the payoff larger or smaller than \$5,000?

 - b. For a low-risk woman, is the expected value of the payoff larger or smaller than \$5,000?

 - c. Is the expected value of the amount the insurance company has to pay a randomly selected woman larger or smaller than \$5,000?

 - d. What potential problem do you see for this insurance company?

6. On long automobile trips, Mrs. Smith drives and Mr. Smith gives directions. When there is a fork in the road, his directions are right 30 percent of the time and wrong 70 percent. Having been misled many times, Mrs. Smith follows Mr. Smith' directions 30 percent of the time and does the opposite 70 percent of the time. Assuming independence, how often do they drive down the correct fork in the road? If Mrs. Smith wants to maximize the probability of choosing the correct road, how often should she follow Mr. Smith's directions?

7. A statistics professor asked 14 students to imagine 10 coin flips and write down the sequence of heads and tails. Thirteen of the 14 students imagined sequences in which there were 4, 5, or 6 heads. If each student had flipped a fair coin ten times and written down the sequence that occurred, what is the probability that 13 or more students would have obtained sequences that had 4, 5, or 6 heads?
8. The daily high temperatures in two cities on December 31 can be described by normal distributions with City A having a mean of 40° and a standard deviation of 10° and City B having a mean of 50° and a standard deviation of 20° . Which city is more likely to have a daily high temperature below 32° ?
9. Answer this question to Ask Marilyn:
I recently returned from a trip to China, where the government is so concerned about population growth that it has instituted strict laws about family size. In the cities, a couple is permitted to have only one child. In the countryside, where sons traditionally have been valued, if the first child is a son, the couple may have no more children. But if the first child is a daughter, the couple may have another child. Regardless of the sex of the second child, no more are permitted. How will this policy affect the mix of males and females?
10. A six-sided die with four green sides and two red sides is rolled 20 times. A contestant chooses one of these three sequences in advance and wins \$25 if it appears in these 20 rolls. Which sequence would you choose?
- RGRRR
 - GRGRRR
 - GRRRRR