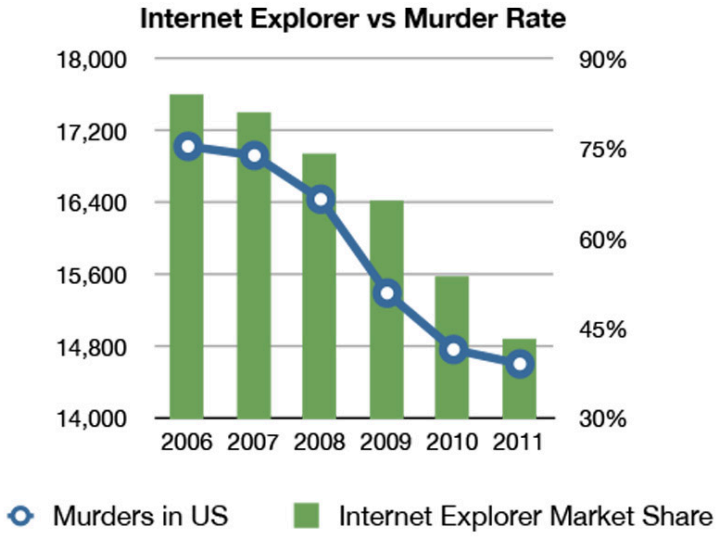
Econ 57
Gary Smith
Spring 2013

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 graphic 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 in one state compared the traffic fatality rates (number of fatalities per miles driven) on highways with 55, 65, and 75 miles per hour speed limits. They found that highways with a 75 mph speed limit had the lowest fatality rate and highways with a 55 mph speed limit had the highest fatality rate. Traffic fatalities could evidently be reduced by raising speed limits, perhaps because people pay more attention when they are driving fast. What is the biggest *statistical* problem with this study?

3. Answer this question to Ask Marilyn, assuming that each birth is an independent event with an equal chance of being male or female: "If you have four children, they may all be of one sex, there may be three of one sex and one of the other sex, or there may be two of each. Which is most likely?"

4. The life of a Rolling Rock tire is normally distributed with a mean of 40,000 miles and a standard deviation of 5,000 miles. Assuming independence, if you buy four tires, what is the probability that

   a. at least one of the tires will last 50,000 miles?

   b. all four tires will last at least 50,000 miles?

   c. the average life of these four tires will be at least 50,000 miles?

5. Explain why you either agree or disagree with this excerpt from a statistics term paper: "If I were to do this study again, I would collect enough responses to account for at least 10% of the population."

6. "Five out of ten people who have this disease die from it. It is lucky you came to me; I've had five patients and they all died." Suppose that there are three kinds of doctors: excellent (10%), good (80%), and incompetent (10%). With an excellent doctor, every patient lives; with a good doctor, half live and half die; and with an incompetent doctor, every patient dies. Given this doctor's track record (5 of 5 died), what is the probability that he/she is incompetent?

7. a. Why, theoretically, is the normal distribution often a good approximation to the binomial distribution?

   b. Why, in practice, is it usually not necessary to use a normal approximation?

8. Ninety eight Pomona students were asked how many times they had talked to their mothers and fathers during the past year: 36 talked to both parents an equal number of days; 9 talked to their fathers more; and 53 talked to their mothers more. If the 62 students who talked more to one parent than the other are equally likely to say mother or father, what is the probability that fewer than 10 would talk more to their father?

9. A ball in a bag is either red or blue, you don't know which. If it is red, you will receive $X. If it is blue, you will receive $100 - $X. You get to choose X before you draw the ball out of the bag. If you assume that the ball is equally likely to be red or blue, what value of X maximizes your expected return?

10. *Good to Great* is a best-selling book about eleven companies that made a leap from being merely good companies to being great companies, as gauged by their stock performance. Jim Collins and his research team spent five years looking at the 40-year history of 1,435 companies and identified 11 stocks that clobbered the average stock market return:

Abbott Laboratories	Kimberly-Clark	Pitney Bowes
Circuit City	Kroger	Walgreens
Fannie Mae	Nucor	Wells Fargo
Gillette	Philip Morris	

After scrutinizing these eleven great companies, Collins identified several common characteristics and attached catchy names to each, like Level 5 Leadership—leaders who are personally humble, but professionally driven to make their company great. What *statistical* problem do you see with his study?