Econ 57
Gary Smith
Spring 2014

Midterm Answers

1. The most appropriate graphs are
   a. time series graph
   b. scatter diagram
   c. scatter diagram
   d. scatter diagram
   e. side-by-side boxplots

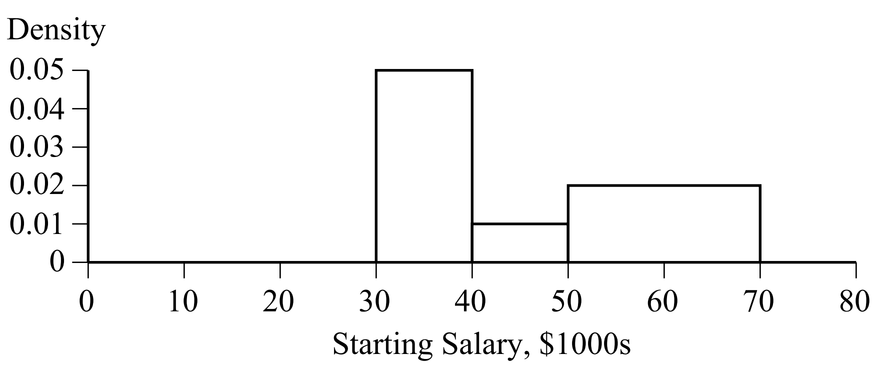
2. Correlation is not causation. Perhaps the kinds of people who do not vote are more likely to commit crimes. (Jason Stanley and Vesla Waever, "Is the United States a 'Racial Democracy'?," *New York Times*, Online January 12, 2014.)

3. It doesn't matter! Let R be the number of red marbles in the first can, with 50 - R marbles in the second can. Because you have an 0.5 probability of selecting each can, your overall probability of picking a red marble is 0.5(R/50) + 0.5((50-R)/50) = 0.5, no matter what the value of R is.

4. The first ball doesn't matter. The second ball must land in one of the three remaining boxes (which has a 3/4 probability of occurring). If it does, then the third ball must land in one of the two remaining boxes (which has a 2/4 probability of occurring). If it does, then the fourth ball must land in the remaining box (which has a 1/4 probability of occurring). Using the multiplication rule, the probability of winning is (3/4)(2/4)(1/4) = 6/64. The expected value of the payoff is (6/64)($5) + (58/64)($0) = $30/64. The expected value of the profit is $1 - $30/64 = $34/64.

5. As the number of binomial trials increases, it is increasingly certain that the success proportion x/n will be close to the success probability π, but less likely that it will be exactly equal to π. Thus the probability
   a. decreases
   b. increases
   c. decreases

6. Adjusting the bar heights for the fact that the last interval is twice as wide as the first two intervals, a histogram looks like this:



7. This is a Bayesian problem:

$$P[\text{A if B}] = \frac{P[\text{A}]P[\text{B if A}]}{P[\text{A}]P[\text{B if A}] + P[\text{no A}]P[\text{B if no A}]}$$

$$= \frac{(.3)(.6)}{(.3)(.6) + (.7)(.1)} = \frac{.18}{.25} = 0.72$$

In a contingency table with 1,000 people:

	B	no B	Total
A	180	120	300
no A	70	630	700
Total	250	750	1000

Therefore, P[A if B] = 180/250 = 0.72

8. This is from Aatish Bhatia, "What does randomness look like?," Empirical Zeal blog December 21, 2012 <http://www.empiricalzeal.com/2012/12/21/what-does-randomness-look-like/>:. Bhatia's answer: "The first student's data has clusters – long runs of up to eight tails in a row. This might look surprising, but it's actually what you'd expect from random coin tosses (I should know – I did a hundred coin tosses to get that data!) The second student's data in suspiciously lacking in clusters. In fact, in a hundred coin tosses, they didn't get a single run of four or more heads or tails in a row. This has about a 0.1% chance of ever happening, suggesting that the student fudged the data (and indeed I did)."

9. There are 36 possible rolls, of which 6 are doubles. So, the probability of rolling a doubles is 6/36 = 1/6. The expected wait is 1 divided by the probability: 1/(1/6) = 6.

10. Scenario (b) because the central limit theorem says that the probability distribution approaches a normal distribution as the number of events being summed increases. The number of trials determines how closely the histogram will be to the probability distribution.