Econ 57
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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 the test score.

1. Many people become real estate agents, hoping to earn big commissions, but then quit after a few disappointing years. A survey of the agents at one real estate firm found that there was a positive relationship between the annual commissions and the number of years working as a realtor. The company's president argued that these results are evidence that new agents shouldn't give up. Why are these data potentially misleading?

2. It has been estimated that, in any given baseball season, Kyle Schwarbek, a Major League Baseball player, has a 0.0412 probability of setting a record by hitting more than 61 home runs that season. If he plays 10 seasons at this level, what is the probability that he will hit more than 61 home runs in at least one of these seasons? (Assume independence.)

3. An insurance company aims to make a 50% return on its life insurance policies: for every dollar customers pay in premiums, the company expects to pay out 50 cents in claims and keep 50 cents for itself. If each person in a certain group of individuals has an independent 0.01 probability of dying within a year, how much should the company charge for a 1-year, $1 million policy in order to expect to meet its goal?

4. Suppose that 90% of the people who enjoyed the television show *Homicide: Life on the Street* also enjoyed the show *The Wire*, while 20% of the people who did not enjoy *Homicide* did enjoy *The Wire*. If 40% of all people enjoyed *Homicide*, what is the probability that a randomly selected person who enjoyed *The Wire* also enjoyed *Homicide*?

5. Suppose two cards are placed in a leather bag. One card is red on both sides; the other card is red on one side and blue on the other side. If you pick a card randomly and look at a side randomly and see that it is red, what is the probability that the other side of the card is also red?

6. It was reported that a fair coin had been flipped in sixty 10-flip sets (a total of 600 flips), and that, in 2 of the 10-flip sets, all 10 flips had been heads and that, in another set, all 10 flips had been tails. What is the probability that a fairly flipped coin would land either all heads or all tails in 3 or more of sixty 10-flip sets?

7. A variable X is normally distributed with a mean of 10 and a standard deviation of 20. Identify the following statements as either true or false.
   a. $P[X > 15] = P[X < 5]$ ☐true ☐false
   b. $P[X > 15] > P[X > 10]$ ☐true ☐false
   c. $P[X > 20] > P[X < 10]$ ☐true ☐false

8. Do you agree or disagree with the following statements?
   a. The total area of the bars in a histogram is equal to 1 ☐yes ☐no
   b. The interquartile range is the distance between the first and third quartiles ☐yes ☐no
   c. The central limit theorem assumes that X has a binomial distribution ☐yes ☐no
   d. The Black Swan problem is an example of self-selection bias ☐yes ☐no

9. A backgammon player needs to roll a 1 on either or both of two 6-sided dice in order to leave the bar and enter the opponent's home board. On average, how many rolls of two dice will it take to get a 1?

10. Identify as many problems as you can find with this figure from a *Forbes* article titled, "True Fact: The Lack of Pirates Is Causing Global Warming."