

Statistics 341
Fall 2007 - Assignment #2
Due Friday, September 19, 2008

1. Problem 2.74
2. Problem 2.77
3. Problem 2.79
4. Problem 2.111
5. Problem 2.114
6. Problem 2.129
7. Problem 2.130
8. In 2006, cyclist Floyd Landis won the sports' premier event, the Tour de France. After completing the race, the World Anti-Doping Agency released test results which indicated that Landis had high testosterone levels in his urine after one of the race stages. After further litigation, the International Court of Arbitration for Sport upheld the test results, stripped Landis of the Tour de France win, and banned him from professional cycling for two years.

During the course of the 2006 Tour de France, Landis submitted 8 urine specimens for analysis. The test results on these 8 specimens depend on the accuracy of the testing procedures. For this problem, assume Landis was NOT doping and that each test result is independent of the others. Let the probability of a correct no-doping test result given the assumption that Landis was not doping to be the value p .

- (a) What is the probability all 8 urine tests would come back with the correct no-doping test result if the value of $p = 0.95$? What about when the value of $p = 0.99$? What about for a general value p ?
 - (b) Determine the value of p so that the probability all 8 urine tests would come back with the correct no-doping test result is 0.99.
9. Now assume that Landis WAS doping. Let the probability of a correct doping test result given the assumption that Landis was doping to be the value r . (Each test result is still independent of all others).
- (a) What is the probability that zero or one test out of the 8 would have a correct doping test result if the value of $r = 0.9$?
 - (b) What is the probability that zero or one test out of the 8 would have a correct doping test result if the value of $r = 0.95$?
 - (c) Write a general formula using r for the probability that zero or one test out of the 8 would have a correct doping test result.

10. In a class there are four freshman boys, six freshman girls, and six sophomore boys. How many sophomore girls must be present if gender and class are to be independent when a student is selected at random?
11. This problem is based on the famous (at least in statistics and mathematics) Monty Hall problem. Monty Hall was the host of a game show called "Let's Make a Deal". In the game, he presents a contestant with three doors. Behind one door is something valuable, like a new car, and behind the other two doors are cheap prizes, like a skillet or a can of soup. Monty Hall begins the game by asking the contestant to pick a door. He then shows the contestant what is behind one of the two doors the contestant did not pick. Behind this door is one of the cheap prizes.

At this point, Monty Hall asks the contestant if they want to stay with the door they originally selected or switch to the other door.

- (a) Which strategy is better, stay or switch, or does it matter? Explain your answer.
- (b) Go to the following web address

<http://www.dcity.org/braingames/3doors/default.html>

Scroll down the page to the game. Pick a strategy (either stay or switch) and play the game 100 times using the strategy you selected. What proportion of times did you win the valuable prize with this strategy?

- (c) Play the game another 100 times using the other strategy (if you switched before, now you stay, or vice versa.) What proportion of times did you win the valuable prize with the other strategy?
- (d) What do you think the probability of winning is if you stay with your original door? What do you think the probability of winning is if you switch doors? Explain your answer.
- (e) A table can be used to determine all the possible outcomes of the game. The theoretical probability of winning with each strategy can then be calculated. Copy the table below to your homework assignment and fill in the missing areas. Use the table to determine the probability of winning when you switch doors and the probability of winning if you stay with your original door. (Are you surprised?)

| Prize is Behind | You Pick | Stay | Switch |
|-----------------|----------|------|--------|
| A | A | Win | Lose |
| A | B | | |
| A | C | | |
| B | | | |
| B | | | |
| B | | | |
| C | | | |
| C | | | |
| C | | | |