Probability of Successive Events Exercise (Section 8.3) NAMES:

These are selected questions (numbers copied from book) from Sets II and III of the exercise set. Turn in one paper per group but be sure all members of the group have seen the final answers. Circle your name if the paper that gets turned in is your copy.

Set II: The following bet is from a book titled *Never Give a Sucker an Even Break.*
Take a small opaque bottle and seven olives, two of which are green, five black. The green ones are considered the "unlucky" ones. Place all seven olives in the bottle, the neck of which should be of such a size that it will allow only one olive to pass through at a time. Ask the sucker to shake them and then wager that he will not be able to roll out three olives without getting an unlucky green one amongst them. If a green olive shows, he loses.

1. Are the events that each successive olive to come out of the bottle is black *dependent* or *independent*? [In other words, does the probability that the second one is black change depending whether or not the first olive was black? If so, then we say the events are dependent.]

2. What is the probability that the first olive that comes out of the bottle is black?

3. Would it be better to bet in favor of its being black or against it?

4. [Assuming the first olive is black], what is the probability that the second olive is also black? [Really picture this situation. After a black olive comes out, you have a bottle with six olives left. How many are black (successes)? Probability is number of successes divided by number of possibilities.]

5. Would it be better to bet in favor of [the second olive] being black or against it?

6. [Assuming the first two olives are black], what is the probability that the third olive is also black? [Really picture this situation. After two black olives come out, how many olives are left in the bottle (possibilities)? How many are black (successes)? Probability is number of successes divided by number of possibilities.]

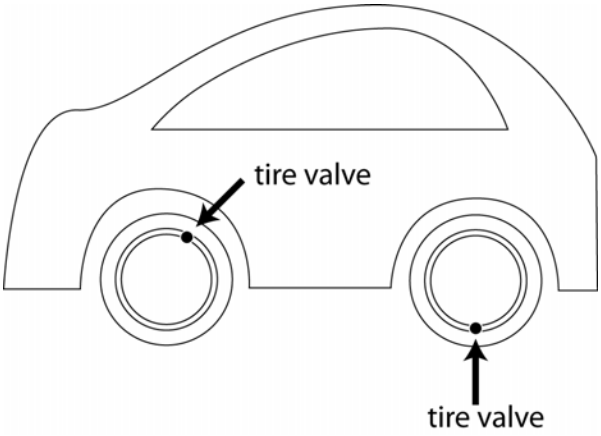
7. Would it be better to bet in favor of [the third olive] being black or against it?

8. What is the probability that all three olives are black? [Multiply the probabilities for questions 2, 4, and 6. Give your answer as a reduced fraction.]

9. Would it be better to bet in favor of all three olives being black or against it?

Set III:

In a court case on a charge of overtime parking, a policeman observed the positions of the valves of the tires on one side of a parked car as shown in this figure. He recorded them as being at “one o’clock” and “six o’clock.”



Later, when the allowed time had expired, he observed that the car was still in the same parking space with the valves of the two tires in the same positions as before. The owner of the car claimed that he had left the parking space before the time had expired and returned to it later. He said the valves being in the same position as before must have been a coincidence.

1. If the position of a tire valve is recorded to the nearest “hour”, how many different positions are possible?

2. What is the probability that one of the valves would be in its original position if the owner of the car was telling the truth?

3. Do you think that the event of each valve returning to its original position is independent or dependent of the other?

4. If the events are independent, what would the probability be of both valves returning to their original positions? [Multiply probabilities as in question 8 in Set II.]

5. If the events are dependent, what effect might that have on the probability of both valves returning to their original positions? [Also, assuming dependence, what is the probability that both valves return to their original position?]

The judge acquitted the defendant but said that he would have been convicted if all four wheels had been checked and found to have been in their original positions.

6. If the events are independent, what would the probability be of all four valves returning to their original positions?

7. Do you think this result, which the judge accepted, applies to this situation? Explain.

[Answer: The wheels of a car do not rotate independently of each other. On a straight road, all wheels rotate together. But when the car turns around a corner, the outside wheels travel farther than the inside wheels. As a result, the outside wheels would rotate farther than the inside wheels. It should be true, during a normal drive, that the two wheels on one side of the car rotate together but that cannot be said of all four wheels.]