Applied Statistics HW 10

1. This is a variation on the previous homework. We will be picking a student at random from the whole Hanover population. Most of these questions require using conditional probabilities and creating decision trees/tree diagrams. We will be looking at their gender, and whether they smoke or not. Imagine the following numbers: There is a 65% chance that the person we select will be female. There is a 25% chance that the person is female AND smokes. There is a 20% chance that the person is male AND smokes.

   a. Suppose we know that we end up with a female. What are the chances, that she would be smoking?

   b. Suppose we know that we end up with a smoker. What are the chances the person would be female?

   c. How does that compare to the chance of getting a female if we didn't have the extra information about smoking? How does that make sense?

2. Consider an unfair coin, one in which heads is more likely, namely heads has a 2/3 chance of occurring. We flip the coin twice.

   a. What are the chances, that we will get the same result in both coin flips?

   b. Suppose we know the result of both flips was the same. Given that, what are the chances that we got heads on the first flip? How do you explain, that this answer is different from the 2/3 chance of a heads occurring?

3. In the semi-finals for our basketball conference title, we will be paired with Anderson, Wabash or Defiance. There is a 50% chance that we will be paired with Anderson, and a 25% chance for each of the other two pairings. If we are paired against Anderson, we have a 30% chance of winning the game against them. If we are paired against Wabash, we have a 50% chance, while if we are paired against Defiance we have an 80% chance.

   a. Draw a decision tree of the possible combinations and results. There should be two steps, one is the team we are paired with, the second whether we win or lose.

   b. What are the chances, that we will be paired with Anderson and win?

   c. Overall, what are our chances of winning the semi-final match?

d. Suppose we know that we won. What are the chances, that we had played against Defiance? Why does it make sense that we got a result larger than the 25% chance of playing Defiance to begin with?

e. Suppose we know we won't be paired up against Defiance. What are our chances of winning now?