Class Exercises. Set 8

1. You have a neighbour who travels a lot. For some obscure reason you want to describe his behavior as a hidden markov model. He is either at home or travelling, and you estimate that when he is at home one day there is a 25% chance that he will travel the next day. Whenever he is travelling, the chance that he is back the next day is 50%. In fact, you cannot observe if he is at home or not; you can only see if his car is parked on the driveway or not. When he is at home, there is a 90% chance that the car is on the driveway. When he travels he usually takes the car, but not always; you estimate that the car is still there 20% of the times when he is travelling.

a. What is the transition matrix for the model? Make sure you state what the rows and columns represent.
b. What is the emission matrix for the model? Again, state what the rows and columns represent.

2. Consider the Dishonest Casino example from the classes (slide 19):
-For the Fair die P(1) = P(2) = P(3) = P(5) =P(6) = 1/6
-For the Loaded die P(1) = P(2) = P(3) = P(5) = 1/10; P(6) = ½
-In average, casino player switches back-&-forth between fair and loaded die once every 20 turns
-There is equal probability of starting to play with either die

You observe a sequence of rolls 1 2 4 6 6 but you were also able to pick behind the curtain 3 times and you know the loaded die was used in the 1st roll and the fair die was used in the 3rd and 4th roll.
a. What is the probability of the data you have observed according to the HMM model?
b. What die was most likely used in the second roll, the fair or the loaded?