AP Statistics - Tree Diagrams

1. A university professor fails 20% of his students in the final. After the final, he polls the students and asks how many of them studied more than 3 hours for it. Of those who passed the final, 72% said that they studied for it. Of those who failed the final, 31% said they studied for it. Make a tree diagram for this problem and then answer the following questions.

Find the probability that

a) a student studies

b) a student doesn't study

c) if a student studies, he passes

d) if a student studies, he fails

e) if a student doesn't study, he fails

f) if a student doesn't study, he passes

2. It is estimated that 4% of people who spend time in the woods will get Lyme disease. Of people with Lyme disease, the test to determine if you have it is will give a positive reading 97% of the time. Of people who do not have Lyme disease, the same test will give a negative rating 92% of the time. Make a tree diagram for this problem and then answer the following questions.

Find the probability that

a) the a person gets a positive reading

b) the a person gets a negative reading

c) if the person gets a positive reading, he has Lyme disease

d) if a person gets a positive reading, he doesn't have Lyme disease

e) If a person gets a negative reading, he doesn't have Lyme disease

f) If a person gets a negative reading, he has Lyme disease

3. I take a true false test. I studied for it and feel well prepared for it. I estimate that I have a 90% chance of knowing the answer (and thus getting it correct). On questions I don't know, I will guess. Make a tree diagram for this problem and then answer the following questions.

Find the probability that

a) I answer a question correctly

b) If I got the question correct, it is because I knew it.

c) If I guess, I get the problem correct.

4. A writer has a bad habit of holding onto pens that stop working. He has 3 pens in his briefcase. The first pen he tries has an 80% chance of working. The second pen has a 60% chance of working and the 3rd pen has a 40% chance of working. If a pen stops working, he'll try another pen. Draw a tree diagram that illustrates this problem.

Find the probability that

a) at least one pen works

b) if the first pen doesn't work, one of the other pens will work.

5. A prominent university decides admissions according to the following criteria.
   - Students with SAT's under 1400 are rejected.
   - Those who are still considered will have their GPA examined. Those with GPA's 3.7 and above are accepted. Those under 3.2 are rejected.
   - Those with GPA's between 3.2 and below 3.7 will have their essays read by 4 admission officers. If 3 out of 4 officers like the essay, then the student is admitted. If not, the student is rejected.

   Over the years, the following statistics have been compiled:
   - On the average, 57% of students who apply to that university have SAT's 1400 or over.
   - Of the students with SAT's 1400 and over...
     - 58% have GPA's 3.7 or above
     - 31% have GPA's between 3.2 and 3.7
   - Of the students who have their essays read, there is a 50% chance that an admission officer will like their essay.

   Make a tree diagram for this problem and then answer the following questions.

Find the probabilities that

a) a student is accepted

b) a student is rejected

c) if a student is accepted, he had a GPA of 3.7 or above

d) if a student is accepted, he got in because of writing good essays

e) If a student is rejected, it's because of his essays

f) If a student has SAT's $\geq$ 1400, he is accepted