CS444 Naive Bayes Classifier Exercises

1. In a medical study, 100 patients all fell into one of three classes: Pneumonia, Flu, or Healthy. The following database indicates how many patients in each class had fever and headache.

   Consider a patient with a fever but no headache.

   (a) What values would a Bayes' optimal classifier assign to the three diagnoses? (A Bayes' optimal classifier *doesn't* make any independence assumptions about the evidence variables.) Again, your answers for this question need not sum to 1.

   (b) What values would a naive Bayes classifier assign to the three possible diagnoses? Show your work. (For this question, the three values need not sum to 1. Recall that the naive Baye's classifier drops the denominator because it is the same for all three classes.)

   (c) What *probability* would a Bayes optimal classifier assign to the proposition that a patient has Pneumonia. Show your work. (For this question, the three values should sum to 1.)

   (d) What *probability* would a naive Bayes classifier assign to the proposition that a patient has Pneumonia. Show your work. (For this question, the three values should sum to 1.)

Pneumonia		
Fever	Headache	count
T	T	5
T	F	0
F	T	4
F	F	1
total:		10

Flu		
Fever	Headache	count
T	T	9
T	F	6
F	T	3
F	F	2
total:		20

Healthy		
Fever	Headache	count
T	T	2
T	F	3
F	T	7
F	F	58
total:		70

2. Use the AIspace Belief Network Tool to create a belief network corresponding to the naive Bayes classifier above. Confirm that the network gives the same probability distribution as you found in question 1d above. Submit a screen capture or print-out of your network with the correct observations set and monitoring enabled for the diagnosis node.