Question 1. Random Forests leverage randomization in two different ways. Name both.

There are two ways in which the trees in a random forest are randomized: by selecting the data points used to build a tree and by selecting the features in each split test.

Question 2. [20 points] Naive Bayes: Below is a simple medical dataset that gives details of symptoms that patients presented and whether they were suffering from meningitis. Included are three descriptive features which are common symptoms of the disease: HEADACHE, FEVER, AND VOMITING

ID	HEADACHE	FEVER	VOMITING	MENINGITIS
1	True	True	False	False
2	False	True	False	False
3	True	False	True	False
4	True	False	True	False
5	False	True	False	True
6	True	False	True	False
7	True	False	True	False
8	True	False	True	True
9	False	True	False	False
10	True	False	True	True

Using this dataset to determine if a patient presenting with the following symptoms would be classified by the model as having meningitis. HEADACHE = true & FEVER = true & VOMITING = true

Frequency Table:-

P(meningitis = T) = 3/10

P(Meningitis = F) = 7/10

P(Headache = Y | Meningitis = Y) = 2/3

P(Headache = Y | Meningitis = N) = 5/7

P(Fever = T | Meningitis = Y) = 1/3

P(Fever = T | Meningitis = N) = 3/7

P(Vomit = T | Meningitis = N) = 2/3

P(Vomit = N | Meningitis = N) = 4/7

P(Meningtis = Y | Head = T,vomit = T,fever = T) = 2/3*1/3*2/3*3/10 = 4/90 = 0.044

P(Meningtis = N | Head = T,vomit = T,fever = T) = 5/7*3/7*4/7*7/10 = 6/49 = 0.122449

P(M|T,H|T,F|T,V|T) = 0.044/(0.044 + 0.122) = 0.265

P(M|F,H|T,F|T,V|T) = 0.122/(0.044 + 0.122) = 0.735

0.122> 0.044 or .735> .265 hence when HEADACHE = true & FEVER = true & VOMITING = true then Meningtis = False

We can predict that the patient will not be diagnosed with Meningitis.