1. A spam filter is designed by looking at commonly occurring phrases in spam. Suppose that 80% of email is spam. In 10% of the spam emails, the phrase "free money" is used, whereas this phrase is only used in 1% of non-spam emails. A new email has just arrived, which does mention "free money". What is the probability that it is spam?

Ans: Let P(Spam)= 0.8

P(Non spam)=0.2

P(FM|Spam)=0.1

P(FM| Non Spam)=0.01

As per Bayes Theorem

P(FM)=P(Spam)*P(FM|Spam) +P(NonSpam)*P(FM|NonSpam)

= (0.8* 0.1)+(0.2*0.01)= 0.082

to find P(Spam|FM)=[P(Spam).P(FM/Spam)]/P(FM)

P(Spam|FM)= [0.8*0.1]/0.082= 0.08/0.082=80/82== 40/41