A crime is committed by one of two suspects, A and B. Initially, there is equal evidence against both of them. In further investigation at the crime scene, it is found that the guilty party had a blood type found in 10% of the population. Suspect A does match this blood type, whereas the blood type of Suspect B is unknown. (a) Given this new information, what is the probability that A is the guilty party? (b) Given this new information, what is the probability that B’s blood type matches that found at the crime scene?'''

Sol:

Let the blood type found at crime seen be X.

Probability that A is gulity prior to the new evidence 𝑃(𝐴)=1−𝑃(𝐵)=0.5

Probability that blood type of X is found given A is gulty = Probability that A has the blood type 𝑃(𝑋|𝐴)=1

Probability that blood type of X is found given B is guilty = Probability that B has the blood type 𝑃(𝑋|𝐵)=0.1

Now it is known that blood type is X, and given exactly one of A or B is guilty,

𝑃(𝐴|𝑋)=𝑃(𝑋|𝐴)𝑃(𝐴)/𝑃(𝑋) =𝑃(𝑋|𝐴)𝑃(𝐴)/𝑃(𝑋|𝐴)𝑃(𝐴)+𝑃(𝑋|𝐵)𝑃(𝐵)=10/11