

1. 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?

**Solution:**

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Solution 1:

Against A and B both suspect have equal evidence.

Initially Guilty Probability

$$P(A) = 0.5$$

$$P(B) = 0.5$$

Let X is a blood group found on crime scene which is 10% in population and it match with A. and B blood group is unknown

So, Probability of blood group when A and B is guilty respectively,

$$P(X|A) = 1 \quad ; \quad P(X|B) = 0.1$$

Using Bayes theorem

$$P(A|X) = \frac{P(X|A)P(A)}{P(X|A)P(A) + P(X|B)P(B)}$$

$$= \frac{(1)(0.5)}{(1)(0.5) + (0.1)(0.5)} = 0.909$$

