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?**

Ans- Let's define the events:

A: Suspect A is guilty.

B: Suspect B is guilty.

E: The blood type matches the one found at the crime scene.

We are given:

P(A) = P(B) = 0.5 (equal evidence against both suspects initially).

P(E|A) = 1 (Suspect A matches the blood type found at the crime scene).

P(E|B) = 0.1 (Probability that Suspect B matches the blood type found at the crime scene).

We want to find:

(a) P(A|E): Probability that Suspect A is guilty given that the blood type matches.

(b) P(E|B): Probability that Suspect B matches the blood type given that the blood type matches.

Using Bayes' theorem:

(a) P(A|E) = (P(E|A) \* P(A)) / P(E)

(b) P(E|B) = (P(B|E) \* P(E)) / P(B)

To calculate P(E), we can use the law of total probability:

P(E) = P(E|A) \* P(A) + P(E|B) \* P(B)

Substituting the given values, we get:

P(E) = 1 \* 0.5 + 0.1 \* 0.5 = 0.55

(a) P(A|E) = (1 \* 0.5) / 0.55 ≈ 0.9091

Therefore, the probability that Suspect A is guilty given that the blood type matches is approximately 0.9091 or 90.91%.

(b) P(E|B) = (P(B|E) \* P(E)) / P(B) = (P(B|E) \* P(E)) / (1 - P(A))

Since P(B) = 0.5 and P(A) = 0.5, P(B) = 1 - P(A)

P(E|B) = (0.1 \* 0.55) / 0.5 = 0.11

Therefore, the probability that Suspect B's blood type matches the one found at the crime scene is 0.11 or 11%.