Statistics Assignment 8

1. a) Let M be the event that A's blood type matches the guilty party's and for brevity, write A for "A is guilty" and B for "B is guilty". By Bayes' Rule,

$$P(A|M) = \frac{P(M|A)P(A)}{P(M|A)P(A) + P(M|B)P(B)} = \frac{1/2}{1/2 + (1/10)(1/2)} = \frac{10}{11}.$$

(We $have\ P(M|B) = 1/10$ since, given that B is guilty, the probability that A's blood type matches the guilty party's is the same probability as for the general population.)

b) Let C be the event that B's blood type matches, and condition on whether B is guilty. This gives

$$P(C|M) = P(C|M,A)P(A|M) + P(C|M,B)P(B|M) = \frac{1}{10} \cdot \frac{10}{11} + \frac{1}{11} = \frac{2}{11}$$