

Example 15 - Bayes' Rule

A lab blood test is 95% effective in detecting a certain disease when it is in fact, present. However the test also yields a "false positive" result for 1% of the healthy people tested.

If 0.5% of the population has the disease what is the probability that a person who was tested positive actually has the disease?

Example 16 - Bayes' Rule

A box contains 7 red and 13 blue marbles. Two balls are selected at random and are discarded without their colors being seen. If a third ball is drawn randomly and observed to be red, what is the probability that both of the discarded balls were blue?

Example 17 - Bayes' Rule

Say I have a wallet that contains either a \$5 bill or a \$ 20 bill (with equal probability), but I don't know which one. I add a \$ 5 bill. Later, I reach into my wallet (without looking) and remove a bill. It's a \$ 5 bill. What is the probability that the bill left in the wallet is a \$ 5 bill?

Example 18 - Bayes' Rule

A plane is missing and it is presumed that it was equally likely to have gone down in any of 3 possible regions. Let $1 - \alpha_i$ denote the probability that the plane will be found upon a search of the i th region when the plane is indeed in that region. What is the conditional probability that the plane is in the i th region given that a search of region 1 is unsuccessful? ($i = 1, 2, 3$)

Example 19 - Independence

An urn contains five red and seven blue balls. Suppose that two balls are selected at random and with replacement. Let A and B be the events that the first and the second balls are red, respectively. Check whether A and B are independent or not. Redo the calculation for the case of random selection without replacement.