

1. A manufacturer has two machines, I and II, which produce the item he manufactures. Machine I is slower, but more reliable. It produces only 25% of the items with 1% of them defective. Machine II is faster but more unreliable. It produces the remainder of the items with 3% of them defective. An inspector randomly selects an item as it comes off the assembly line. If the item is defective, what is the probability that it came from machine I?

2. Suppose that a certain disease can be detected by laboratory blood test with probability 0.94. (That is, if a person has the disease, the probability is 0.94 that the test will reveal it.) Unfortunately, this test also gives a “false positive” in 1% of the healthy people tested. (That is, if a healthy person takes the test, it will imply (falsely) that the person has the disease with probability 0.01.) Suppose that 1000 persons have been tested, of whom only 5 have the disease. If one of the 1000 persons is randomly selected, find the probability that:
 - (a) the person is healthy
 - (b) the test shows “positive”
 - (c) the person is healthy, given that the test is “positive”.

3. In a state where cars have to be tested for emission of pollutants, 25% of all cars emit excessive amounts of pollutants. When tested, 99% of all cars that emit excessive amounts of pollutants will fail, but 17% of the cars that do not emit excessive amounts of pollutants will also fail. What is the probability that a car which fails the test actually emits excessive amounts of pollutants?

4. A hotel gets rent-a-cars for its guests from three firms: 25% from Avis, 25% from National, 50% from Hertz. Suppose 8% of Avis cars need tune ups, 6% of Nationals need tune ups, and 15% of Hertz need tune ups. A guest requests a rent-a-car. It needs a tune up. What is the probability that it came from National?