

Math 180 Homework #3
Due Wednesday, September 25

1. You are on the Olympic committee responsible for testing athletes for the use of performance-enhancing drugs. A high-profile athlete just tested positive for drugs. You have the following data. When given to a drug-using athlete, the chances are 50% that the test will come back positive. One in ten athletes uses drugs. The false positive rate is 1%. The committee chair argues that the test is 99% accurate, and so the athlete should be suspended. What counter-argument can you give? Are you convinced beyond a reasonable doubt that the athlete is a drug user?
2. Suppose you are on a jury for a criminal trial. Based on all the evidence you have seen so far, you decide that there is a 60% chance that the defendant actually committed the crime. At the end of the trial, new evidence is introduced: the attacker's blood was found on the scene, and a blood test produced a match with the defendant. An expert witness testifies that that the attacker's blood would certainly produce a match, but that 10% of the population would also produce a match, despite being innocent. How do you revise your estimate of the probability of guilt? Explain your reasoning.
3. 15% of the population carry the genetic marker for disease A . Of those who carry the genetic marker for disease A , 20% carry the genetic marker for disease B .
 - What percent of the total population carry the genetic marker for both diseases?
 - What percent of the total population carry the genetic marker for disease A , but not for disease B ?
 - What percent of the total population carry the marker for disease B ?