DTP-Math-Circle: Session 3—Conditional probability

Sept 30 2022

5   Disease test

There is a disease named X that has infected about 1% of the population. This is known to you. You also know that people infected with disease X show no symptoms.

Thus, a special medical test has been created to determine whether a person has disease X. This test is randomly administered in the population.

The test has a 98% accuracy for positive results and 97% accuracy for negative results. This means: if a person is infected then there's a 98% chance they will test positive and a 2% chance they will test negative. Similarly, if a person is not infected, then there's a 97% chance they will test negative and a 3% chance they will test positive.

If you took the test and it came back positive, what is the probability that you are infected? What is the main thing that determines how big or small this probability is? To appreciate this, you can try and rework this question if you now know that 10% of the population is infected.