Worksheet #23; date: 11/26/2018
MATH 55 Discrete Mathematics

1. *(Rosen 7.3.5)* Suppose that 8% of all bicycle racers use steroids, that a bicyclist who uses steroids tests positive for steroids 96% of the time, and that a bicyclist who does not use steroids tests positive for steroids 9% of the time. What is the probability that a randomly selected bicyclist who tests positive for steroids actually uses steroids?

2. *(Rosen 7.3.10)* Suppose that 4% of the patients tested in a clinic are infected with avian influenza. Furthermore, suppose that when a blood test for avian influenza is given, 97% of the patients infected with avian influenza test positive and that 2% of the patients not infected with avian influenza test positive. What is the probability that:

   (a) a patient testing positive for avian influenza with this test is infected with it?

   (b) a patient testing positive for avian influenza with this test is not infected with it?

   (c) a patient testing negative for avian influenza with this test is infected with it?

   (d) a patient testing negative for avian influenza with this test is not infected with it?

3. The prevalence of breast cancer among 30 year old women is 1%. Mammogram as a screening test shows positive 80% of the time on women with breast cancer, but 10% on women without breast cancer. If a 30 year old woman is tested positive, how worried should she be? Suppose we want 90% of the women who are tested positive to actually have cancer, how much false positive should we tolerate?

4. A satellite transmits one of three messages using a bitstring as its code. Suppose the three messages are encoded as 00, 01 and 10, and each bit has a 1/3 chance of being corrupted. Suppose also all three codes are used equally as frequent. What is the probability that:

   (a) the sent message is 00 given that the received message is 00?

   (b) the sent message is 01 given that the received message is 01?

   (c) the sent message is 00 given that the received message is 11?