

## Math 55 Discussion problems 16 Mar

1. Suppose that Ann selects a ball by first picking one of two boxes at random and then selecting a ball from this box. The first box contains three orange balls and four black balls, and the second box contains five orange balls and six black balls. What is the probability that Ann picked a ball from the second box if she has selected an orange ball?
2. 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. Suppose that  $E$ ,  $F_1$ ,  $F_2$ , and  $F_3$  are events from a sample space  $S$  and that  $F_1$ ,  $F_2$ , and  $F_3$  are pairwise disjoint and their union is  $S$ . Find  $p(F_2|E)$  if  $p(E|F_1) = \frac{2}{7}$ ,  $p(E|F_2) = \frac{3}{8}$ ,  $p(E|F_3) = \frac{1}{2}$ ,  $p(F_1) = \frac{1}{6}$ ,  $p(F_2) = \frac{1}{2}$ , and  $p(F_3) = \frac{1}{3}$ .
4. Ramesh can get to work in three different ways: by bicycle, by car, or by bus. Because of commuter traffic, there is a 50% chance that he will be late when he drives his car. When he takes the bus, which uses a special lane reserved for buses, there is a 20% chance that he will be late. The probability that he is late when he rides his bicycle is only 5%. Ramesh arrives late one day. His boss wants to estimate the probability that he drove his car to work that day.
  - (a) Suppose the boss assumes that there is a  $\frac{1}{3}$  chance that Ramesh takes each of the three ways he can get to work. What estimate for the probability that Ramesh drove his car does the boss obtain from Bayes' theorem under this assumption?
  - (b) Suppose the boss knows that Ramesh drives 30% of the time, takes the bus only 10% of the time, and takes his bicycle 60% of the time. What estimate for the probability that Ramesh drove his car does the boss obtain from Bayes' theorem using this information?