

**Assigned:** Wednesday, September 24, 1997

**Due:** Wednesday, October 1, 1997

**Reminders:** No class on Friday October 3.

**Hour Exam I is on Tuesday October 14, 7 pm to 8 pm, in 228**

### Natural History

**Reading:** Ross, Chapter 3

**Noncredit Exercises:** (Do not turn these in) Ross pp. 104-117: 53, 58, 59, 62, 63

Those with the 4th edition should try: Ross, pp. 112-125: 50, 52, 53, 57, 58.

### Problems:

1. Ross, #12, p. 105 (#13, p. 113 for those using the 4th edition)
2. Ross, #19, p. 106 (#20, p. 114 for those using the 4th edition)
3. Ross #5, p. 123 (#37, p. 117 for those using the 4th edition). In addition to the probability asked for, find the probability that the second ball is red, and determine if it is smaller or larger or the same as the probability that the first ball is red.
4. (Remember: 99.44% of all statistics are made up by the writer)  
The experiment consists of picking a flight at random from all the United Airlines and America West flights landing at Chicago, Los Angeles, Phoenix, San Diego, or San Francisco. Let U and W respectively denote the event that the chosen flight is an United Airlines or an America West flight, let C, L, X, D, and F respectively denote the event that the chosen flight is landing at Chicago, Los Angeles, Phoenix, San Diego, or San Francisco, and let T denote the event that the chosen flight is on time. The conditional probabilities of on-time arrival are as follows:

$$P(T|UC) = 0.85, \quad P(T|UL) = 0.92, \quad P(T|UX) = 0.95, \quad P(T|UD) = 0.91, \quad P(T|UF) = 0.83,$$

$$P(T|WC) = 0.78, \quad P(T|WL) = 0.88, \quad P(T|WX) = 0.92, \quad P(T|WD) = 0.85, \quad P(T|WF) = 0.73.$$

- (a) Based on this data, which airline would you say has better on-time performance? Does the answer depend on which airport you are talking about?
- (b) Use the fact that {C, L, X, D, F} form a partition of the sample space to show that the average on-time arrival probability  $P(T|U)$  for United flights is given by

$$P(T|U) = P(T|UC)P(C|U) + P(T|UL)P(L|U) + P(T|UX)P(X|U) + P(T|UD)P(D|U) + P(T|UF)P(F|U)$$

where  $P(C|U)$  is the conditional probability that the flight is landing at Chicago given that it is a United flight etc. State a similar expression for  $P(T|W)$ .

- (c) 60% of United Airlines flights land at its hub (snowy Chicago), 15% at each of LA and San Francisco, and 5% at each of Phoenix and San Diego. 75% of America West flights land at its hub (sunny Phoenix), 10% at LA, and 5% at each of the other three airports.

Use these numbers in the formula of part (b) and show that  $P(T|U) < P(T|W)$ , i.e., United has a worse average on-time performance even though it beats America West at all the five airports! Write a short explanation of the discrepancy between the per-airport on-time performance and the overall on-time performance.

5. It is known that 75% of the students in ECE 309 are males. It is also known that 80% of the males and 60% of the females are right handed. The remaining students are left handed.
  - (a) If a student is chosen at random from the ECE 309 class, what is the probability that this student is right handed?
  - (b) Given that the student chosen is right handed, what is the probability that the student is female?
  - (c) Now you learn that 1/3 of the left-handed male students and 1/2 of the left-handed female students in ECE 309 can also write with their right hands. If a student chosen at random from the ECE 309 class can write with his or her right hand, what is the probability that the student is female?
6. Ross, #31, p. 108. (p. 116 for those using the 4th edition). Here, we have to decide between two possibilities:  
 $H_0$ : Class A is the superior class and Class B is the inferior class  
 $H_1$ : Class A is the inferior class and Class B is the superior class