STAT 134 (P2): CONCEPTS OF PROBABILITY, UC BERKELEY, SPRING 2013

## Problem Set 3

Instructor: Prof. Yun S. Song

Due: February 14, 2013, in the beginning of class.

- 1. Consider a biased coin that shows heads with probability p and tails with probability 1 p.
  - (a) Suppose Alice tosses the coin exactly 100 times. Let "H = i" denote the event of observing i heads and "T = j" the event of observing j tails. For  $0 \le i, j \le 100$ , find  $\mathbb{P}(H = i, T = j)$ ,  $\mathbb{P}(H = i)$ , and  $\mathbb{P}(T = j)$ . Are "H = i" and "T = j" independent events?
  - (b) Suppose Alice is given a random number generator that returns a non-negative integer k with probability  $e^{-\lambda}\lambda^k/k!$ , where  $\lambda > 0$  (i.e., it follows a Poisson distribution with parameter  $\lambda$ ). Alice uses the random number generator to obtain a single non-negative random integer and tosses the biased coin exactly that many times. As before, let "H = i" denote the event of observing i heads and "T = j" the event of observing j tails. For non-negative integers i, j, find  $\mathbb{P}(H = i, T = j)$ ,  $\mathbb{P}(H = i)$ , and  $\mathbb{P}(T = j)$ . Are "H = i" and "T = j" independent events?
- 2. Do the following problems from the textbook: 2.2(17); 2.4(6, 8); 2.5(4, 8)