

**CE 311S: Homework 3**  
Due Friday, February 18

**Problem 1.** During registration, 80 students try to sign up for the 76 seats in a class. The random variable  $X$  represents how many students who show up on the first day. These students are the only ones interested in the class, and the others will drop it. The probability mass function of  $X$  is:

$x$	70	71	72	73	74	75	76	77	78	79	80
$p(x)$	0.01	0.02	0.03	0.05	0.06	0.17	0.25	0.14	0.12	0.10	0.05

- (a) What is the probability that everyone who is interested in the class can take it?
- (b) What is the probability that at least one interested person cannot take the class?
- (c) What is the probability of there being at least one empty seat?
- (d) What are the expected value and standard deviation of  $X$ ?
- (e) Let  $Y$  represent the number of interested students who can't get in this semester. What are the pmf, expected value, and standard deviation of  $Y$ ?

**Problem 2.** Each part of this problem describes a random variable. Indicate what kind of discrete random variable it is (hypergeometric, Poisson, etc.) and its mean and standard deviation, *in addition* to anything else asked.

- (a) I need to find 10 volunteers for a survey; the probability any given person agrees to take my survey is 0.05.  $X$  is the number of people I ask until I find all of the volunteers.
- (b) 3 of the 10 volunteers have the unfortunate disease *rubella combinatorica*. I split my volunteers into a control group and an experimental group, each containing 5 members.  $Y$  is the number of volunteers in the control group who have *rubella combinatorica*. What is  $P(Y = 2)$ ?
- (c) I am standing at a street corner.  $T$  is the number of empty taxis which drive by in the next 30 minutes; on average, an empty taxi drives by once every five minutes. What is the probability that at least one empty taxi drives by?
- (d) Once I'm in the taxi, the route to my home will pass 15 traffic signals. If the probability that each traffic signal is green when the taxi arrives is 0.6 (independent of all other traffic signals),  $Z$  is the number of times the taxi has to stop at a red light.

**Problem 3.** You are playing a simple game of chance with 50-50 odds: you make a wager, and with equal probability you make that much money or lose that much. You have \$31, and adopt the following strategy: you start by betting \$1. If you win, you stop playing and walk away with your winnings. If you lose, you double your bet and play again (the logic is that whenever you win, you make back everything you lost plus \$1 more). You continue playing until you either win, or run out of money first. What is the expected return from this strategy? What is the standard deviation?