MATH 201: Written Homework 8
Due Thursday, 6/20 by 1pm EDT

(P1) There are 7 students stepping into the elevator on the ground floor in the Hylan building which has floors numbered $\{G, 1, 2, ..., 11\}$. Each one of the students needs to get to a floor which is chosen uniformly at random from $\{1, ..., 11\}$ (more than one student may get off on a given floor). Let N be the number of floors that the elevator stopped in (not counting G where they got on) until the last student stepped out. Find the expected value of N. Hint: start by letting I_j be the indicator random variable for the event that at least one student gets out at floor j.

(P2) Referring to the previous problem, let X_i be the number of students that stepped out on floor i.

(a) Find $E[X_i]$ for each i.

(b) Find the covariance between X_1 and X_2.

(P3) Suppose that a professor chooses a random student in a class of 50 students (there are 28 girls and 22 boys in the class) to perform a calculation on the board. The professor repeats this procedure 20 times, choosing a new student each time (i.e. no student will go twice). Let X be the total number of girls chosen. Calculate the mean and variance of X. Hint: start by letting I_j be the indicator random variable for the event that a girl was chosen for calculation j. Notice that the distribution of I_j does not depend on j.