STAT/MA 41600
Practice Problems: November 24, 2014

1. Consider a tray with 8 lemonades and 3 raspberry juices. Alice and Bob each take 1 drink from the tray, without replacement. Assume that all of their choices are equally likely. Let X be the number of lemonades that Alice and Bob get. (Note: X is either 0, 1, or 2.) Find the variance of X.

2. In question #1, let X_1 and X_2 indicate (respectively) if Alice and Bob (respectively) get lemonade. In other words, $X_1 = 1$ if Alice gets lemonade, or $X_1 = 0$ otherwise; and $X_2 = 1$ if Bob gets lemonade, or $X_2 = 0$ otherwise.

Find the correlation $\rho(X_1, X_2)$ between X_1 and X_2.

3a. Suppose that X is a continuous random variable that is Uniformly distributed on $[10, 14]$, and suppose $Y = 2X + 2$. Find $\mathrm{Cov}(X, Y)$, i.e., the covariance of X and Y.

b. Find the correlation $\rho(X, Y)$ of X and Y.

4a. Suppose that X is a continuous random variable that is Uniformly distributed on $[3, 6]$, and suppose $Y = (X-1)(X+1) = X^2 - 1$. Find $\mathrm{Cov}(X, Y)$, i.e., the covariance of X and Y.

b. Find the correlation $\rho(X, Y)$ of X and Y.

5. Roll two 4-sided dice (*not 6-sided dice*). Let X be the minimum value, and let Y be the maximum value. Find the covariance of X and Y.