STAT/MA 41600
In-Class Problem Set #39 part 2: November 17, 2017

1. As in question 3abc on Problem Set 12, suppose we draw 5 cards at random, without replacement, from a deck of 52 cards (such a deck includes 4 Queens). Let X denote the number of Queens drawn. Define $X_i = 1$ if the ith card selected is a Queen, and $X_i = 0$ otherwise.

For $1 \leq i \leq 5$ and $1 \leq j \leq 5$ with $i \neq j$, for the correlation between X_i and X_j.

2. As in question 4 on Problem Set 12, a family with three daughters and three sons needs to go to the grocery store. Besides the father, who is driving the car, exactly three of the children can come along to the grocery store with him. Suppose that the three children to join the father are chosen randomly, and all such choices are equally likely. Let X denote the number of daughters who accompany the father to the grocery. Define $X_i = 1$ if the ith child who joins the father is a girl, and $X_i = 0$ otherwise.

For $1 \leq i \leq 3$ and $1 \leq j \leq 3$ with $i \neq j$, for the correlation between X_i and X_j.

3. Consider a pair of random variables X and Y whose joint probability density function is constant on the triangle with vertices at the points $(-4, 0)$, $(0, 2)$, and $(8, 0)$.

Find the correlation between X and Y.

4. As in question 1 on Problem Set 26, suppose that X and Y have joint probability density function $f_{X,Y}(x, y) = (3/4)(x - y)$ for $0 < y < x < 2$, and $f_{X,Y}(x, y) = 0$ otherwise.

Find the correlation between X and Y.