

1. Suppose that  $X$  and  $Y$  have joint probability density function

$$f_{X,Y}(x,y) = \begin{cases} \frac{1}{12}(4 - xy) & \text{if } 0 < x < 2 \text{ and } 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find the correlation  $\rho(X,Y)$  between  $X$  and  $Y$ . You are welcome to use the fact that  $\text{Cov}(X,Y) = -4/81$ , as discovered on Friday.

2. A bag contains 10 red bears, 10 green bears, and 10 blue bears. Ten children pick 3 bears each, without replacement. Let  $X$  denote the number of children who get 3 differently colored bears, i.e., one bear of each color. Find  $\text{Var}(X)$ .

3. A standard deck of 52 cards has 4 Queens. Alice picks 5 cards and Bob picks 5 cards (all without replacement) at random from a shuffled deck of 52 cards. Let  $X$  denote the number of Queens that Alice chooses. Let  $Y$  denote the number of Queens that Bob chooses. Find the covariance of  $X$  and  $Y$ .

4. Consider a pair of random variables  $X$  and  $Y$  with joint probability density function  $f_{X,Y}(x,y) = \frac{1}{8}xy$  for  $x,y$  in the triangle where  $0 < x < 2$  and  $0 < y < 2x$ , and  $f_{X,Y}(x,y) = 0$  otherwise.

4a. Find  $\text{Cov}(X,Y)$ .

4b. Find  $\rho(X,Y)$ .