1. Consider two six sided dice. One die has 2 red, 2 green, and 2 blue sides. The other die has 3 red sides and 3 blue sides. Roll both dice, and let $X$ denote the number of red sides that appear. Find the variance of $X$.

2. A bag of candy contains 10 green M&M's and 10 red M&M's. Suppose that 10 students pick 2 candies each, without replacement. Let $X$ denote the number of students who get one red and one green candy. Find $\text{Var}(X)$.

3. Consider a pair of random variables $X, Y$ with constant joint density on the triangle with vertices at $(0, 0), (5, 0), (0, 5)$. Find the covariance of $X$ and $Y$.

4. Suppose $X$ and $Y$ have joint density $f_{X,Y}(x, y) = e^{1-x}$ for $x, y$ in the region where $0 < x < y < 1$, and $f_{X,Y}(x, y) = 0$ otherwise. Find the covariance of $X$ and $Y$.

[Note: It might look strange to have a joint probability density function of $X$ and $Y$ with no $y$’s in it, but this is OK. This function is constant with regard to $y$, i.e., it does not change as $y$ changes. You can check, for instance, that $f_{X,Y}(x, y)$ is a valid probability density function because it is nonnegative and because $\int_0^1 \int_x^1 e^{1-x} \, dy \, dx = 1$.]

[Hint: Just to save you having to do so many integration by parts, for your convenience, we have: $\int_0^1 e^{-x} \, dx = 1 - e^{-1}$ and $\int_0^1 xe^{-x} \, dx = 1 - 2e^{-1}$ and $\int_0^1 x^2 e^{-x} \, dx = 2 - 5e^{-1}$ and $\int_0^1 x^3 e^{-x} \, dx = 6 - 16e^{-1}$.]