STAT/MA 41600
In-Class Problem Set #34: November 4, 2016

**1.** Consider a Beta random variable $X$ with parameters $\alpha = 3$ and $\beta = 2$.
**1a.** Is it more likely that $X$ is smaller than $1/2$ or larger than $1/2$?
**1b.** Verify directly, *without using the general formula* $\mathbb{E}(X) = \alpha/(\alpha+\beta)$, that the expected value of $X$ is $\mathbb{E}(X) = 3/5$.

**2.** Same setup as question #1.
**2a.** Find $P(X > 1/2 \mid X > 1/4)$. [Hint: You can use your work from 1a to help with 2a.]
**2b.** Find the probability that the distance between $X$ and $1/2$ is at least $2/5$, i.e., find $P(|X - 1/2| > 2/5)$.

**3.** Same setup as question #1. If $U$ is a continuous uniform random variable on $(0, 1)$ and $U$ is independent from $X$, find $P(U < X)$.

**4.** Review question: Roll a die until the first 5 appears. Let $X$ denote the number of rolls needed (including the 5 itself). Find the probability that $X$ is an even number.