STAT/MA 41600
In-Class Problem Set #8: September 9, 2016

1. Consider two dice. One is a 6-sided die that has 2 red sides and 4 green sides. The other is a 4-sided die that has 1 red side and 3 green sides. Roll both dice. If their colors agree, let $X = 1$. Otherwise, let $X = 0$. What is the probability mass function of X?

2. Research company Gartner suggests that 80.7% of people own an Android, and 17.7% own an iPhone. For simplicity, assume nobody owns both types. Also assume that the other 1.6% of people do not have a cell phone. Suppose that 90% of iPhone customers are "satisfied," and 70% of Android customers are "satisfied", and 0% of people without a cell phone are satisfied.

2a. Suppose that you interview people until you meet the first person who is an iPhone customer, and then you stop afterwards. Let X be the number of people interviewed (including this final person, who owns an iPhone). What is the probability mass function of X?

2b. If x is a positive integer, what is $F_X(x)$, i.e., what is $P(X \leq x)$? (In this case, it is easier to start by calculating the complement.)

2c. Suppose that you interview people until you meet the first person who is a *satisfied* iPhone customer, and then you stop afterwards. Let Y be the number of people interviewed (including this final person, who owns an iPhone that he/she is satisfied with). What is the probability mass function of Y?

3. Roll a pair of 6-sided dice repeatedly, until the sum of the two dice is 7 or larger. Let X denote the value of the sum on this final roll. What is the probability mass function of X?

4. Suppose Alice takes a cookie and then Bob takes a cookie (each of them without replacement), from a jar that contains 5 cookies, 3 of which are chocolate, and the other 2 are non-chocolate. Let $X = 1$ if Alice gets chocolate; let $X = 0$ otherwise. Let $Y = 1$ if Bob gets chocolate; let $Y = 0$ otherwise.

4a. Find the probability mass function of X.

4b. Find the probability mass function of Y.

4c. Do the solutions to **4a.** and **4b.** change if Bob chooses his cookie first?