STAT/MA 41600
In-Class Problem Set #10: September 16, 2015

1a. Consider 5 fish in a bowl: 3 of them are red, and 1 is green, and 1 is blue. Select the fish one at a time, without replacement, until the bowl is empty. Let $X = 1$ if all of the red fish are selected, before the green fish is selected; and $X = 0$ otherwise. Find $\mathbb{E}(X)$. (Hint: You already found $p_X(1)$ on Monday, and $p_X(0)$ is just the complementary probability.)

1b. Suppose that 60% of people in Chicago are fans of da Bears. Assume that the fans' preferences are independent. We interview 3 fans, and we let X denote the number of fans of da Bears. Find $\mathbb{E}(X)$. (Hint: You just found $p_X(x)$ on Friday, September 11, in problem set 8.)

2. Suppose that a drawer contains 8 marbles: 2 are red, 2 are blue, 2 are green, and 2 are yellow. The marbles are rolling around in a drawer, so that all possibilities are equally likely when they are drawn. Alice chooses 2 marbles without replacement, and then Bob also chooses 2 marbles without replacement. Let Y denote the number of red marbles that Alice gets, and let X denote the number of red marbles that Bob gets.
2a. Find probability mass function for Y, i.e., for the number of red marbles that Alice gets, i.e., find $p_Y(y)$ for $y = 0, 1, 2$.
2b. Find $\mathbb{E}(Y)$.
2c. Is $\mathbb{E}(X)$ the same as $\mathbb{E}(Y)$? I.e., is the expected number of marbles that Bob gets the same or different? Why or why not?

3. 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.
3a. Find $p_X(x)$ for $x = 0, 1, 2$.
3b. Find $\mathbb{E}(X)$.

4. Consider a collection of 9 bears. There is a family of red bears consisting of one father bear, one mother bear, and one baby bear. There is a similar green bear family, and a similar blue bear family. We draw 5 consecutive times from this collection *without replacement* (i.e., not returning the bear after each draw). We keep track (in order) of the kind of bears that we get. Let X denote the number of red bears selected.
4a. Find $p_X(x)$ for $x = 0, 1, 2, 3$. (Hint: There is nothing new to do here, because if you go back to Problem Set #2, question 1b, you can just use the fact that $p_X(x) = P(A_x)$. In other words, $p_X(0) = P(A_0) = 1/21$, etc.)
4b. What is $\mathbb{E}(X)$?