STAT/MA 41600
In-Class Problem Set #3: August 27, 2018

1. Suppose that 30% of a professor's emails are related to classes, 45% are related to research (not classes), and 25% are unrelated to work. Also suppose that the types of emails the professor receives are independent.
1a. The first time that a professor receives an email related to work, what is the probability that it relates to classes?
1b. Consider the number of emails that a professor needs to receive, to get the first one that is unrelated to work. What is the probability that it takes 7 or more emails for this to happen?

2. Roll a pair of 6-sided dice until their values are different. On such a roll (where their values are different), what is the probability that:
2a. The sum of the two dice is strictly more than 8?
2b. The sum of the two dice is strictly less than 8?
2c. The sum of the two dice is exactly 8?

3. On a streaming radio station, suppose the genres of music of the songs are independent. Suppose that 15% of the songs are reggae; 20% are rap; 30% are R&B; and 35% are hip hop.
3a. Jennifer listens until the first R&B song is played. Her boyfriend Sean prefers to hear rap songs. What is the probability that, while waiting for Jennifer's first R&B song to play, Sean gets to hear exactly two rap songs? (We do not restrict other songs from playing in the meantime, e.g., perhaps some reggae and hip hop songs will play as well.)
3b. After Jennifer eventually hears an R&B song, her and Sean continue to listen. When the next non-R&B song plays, what is the probability that it is a rap song?

4. Mary draws bears (with replacement) from a bin with equal numbers of bears of six colors, until she gets the first purple or orange bear, and then she stops afterwards.
4a. What is the probability that she needs strictly more than 8 draws (including the purple or orange bear)?
4b. What is the probability that she needs strictly less than 8 draws (including the purple or orange bear)?
4c. What is the probability that she needs exactly 8 draws (including the purple or orange bear)?

Extra brain stretch for tonight. (Does not need to be completed in class today.)

Can we design a pair of 6-sided dice (not necessarily labelled the same way), so that the distribution of the *sum of the two dice* is the same as for a regular pair of 6-sided dice?