Math 55 Quiz 10
November 2, 2016

This quiz will be graded out of 15 points; the True/False question is worth 3 points, and the exercise is worth 12 points. Please read the instructions carefully.

True or False. Mark the following statements as either true or false, or leave a blank if you don't know. A correct answer is worth +1 point, a blank is worth 0 points, and an incorrect answer is worth -1 points, so be smart about guessing!

a. T — A Bayesian spam filter uses conditional probability estimates to filter out emails that have a high likelihood of being spam based on specific words contained in the message.

b. F — The Ramsey number $R(m, n)$, where m and n are positive integers greater than or equal to 2, denotes the maximum number of people at a party such that there are either m mutual friends or n mutual enemies, assuming that every pair of people at the party are friends or enemies.

c. F — Two events E and F are said to be independent if $p(E \cap F) = p(E) + p(F)$.

Exercise. I have a biased coin which lands on heads with probability 1/3 and lands on tails with probability 2/3. (Assume that the coin never lands on its side.) If I flip this coin 6 times, what is the probability that the coin will land on heads an odd number of times?

The probability of getting k heads out of 6 is given by the binomial distribution as $\binom{6}{k} \cdot (1/3)^k \cdot (2/3)^{6-k}$. Thus we can add the probabilities corresponding to the events of getting 1, 3, and 5 heads (disjoint events) to get

$$p = \binom{6}{1} \cdot (1/3) \cdot (2/3)^5 + \binom{6}{3} \cdot (1/3)^3 \cdot (2/3)^3 + \binom{6}{5} \cdot (1/3)^5 \cdot (2/3).$$