

Homework 5

Do the problems on **Webwork** and turn the following problems in class on Feb. 28th.

Homework should be written neatly and clearly explained. If it requires more than one sheet, the sheets must be stapled. Include your name and id number in the top right corner of your homework.

Problem 1. We have a biased coin (probability of heads is equal to $1/4$). Consider the following 2 step process:

In the first step we flip the coin until we get a heads. Let X denote the trial on which the first heads occurs.

In the second step we flip the coin X more times. Let Y be the number of heads in the second step.

- (a) For each non-negative integer, k , what is the probability that $X = k$?
- (b) Conditioned on the event $\{X = k\}$. What is the probability $Y = 0$?
- (c) Use the Law of Total Probability to compute the unconditional probability that $Y = 0$.

Problem 2. You are dealt one card from a full deck of 52 cards and your opponent is dealt two cards (without replacement). If you get a card between 6 and 10 (inclusively) your opponent pays you 4, if you get a King or Queen your opponent pays you 3. If you don't have a 6-10, Queen or King, but you have more hearts than your opponent, they pay you 1. In all other cases you pay 2. What is the expectation of your winning? (you paying would be a negative winnings)