

Homework 1 – Due Friday, January 24, 2019 at noon

Submit solutions to problems 1 and 2 on separate sheets. They will be graded by different people.

Page limit You can submit **at most** 1 sheet of paper per problem, even if the problem has multiple parts. If you submit a longer solution for some problem, only the first sheet of paper will be graded.

Exercises Please practice on exercises in Chapter 1 of Mitzenmacher-Upfal.

Problems

0. (0 points) The following steps are required to get you started in the course.

- (a) Sign up on piazza at piazza.com/bu/spring2020/cs537.
- (b) Read and sign the Collaboration and Honesty Policy and submit it to the TF in class or with your homework. We will be able to grade your homework only after you hand this in.
- (c) (**Nameplate**) Please print out a nameplate with your name and bring it to every lecture and discussion. A template is available at the bottom of the course web page.
- (d) Check out the following links and resources:
 - i. course webpage: <https://cs-people.bu.edu/sofya/cs537/>;
 - ii. supplementary textbook to review proof techniques:
Richard Hammack. *Book of Proof*: <http://www.people.vcu.edu/~rhammack/BookOfProof/>
- (e) Familiarize yourself with the homework template files at the bottom of the course webpage. Note that each problem has to be submitted separately and each must include a note about collaborators (even if you did the problem by yourself).

1. (**Probability review, 10 points**) For each part below, explain how you got your answer. Nearly all points will be allocated for explanation. Thirteen cards are drawn (without replacement) from a standard deck of 52 cards. What is the probability that:

- (a) they are all spades?
- (b) they are all black?
- (c) they are not all of one color, given that none of the cards is an ace?
- (d) none of the cards is an ace and none is a heart?
- (e) there are 5 cards of one suit and 8 card of another suit?

2. (**Homework assignments, 10 points**)

- (a) You start working on the first homework as soon as it is assigned to you. Every time a new homework is assigned, you switch to working on it with a certain probability and keep working on your current homework with the remaining probability. Specifically, when homework k is assigned, you switch to working on this homework with probability $1/k$. Prove that you are equally likely to work on any homework assigned so far. (In other words, the homework you are working on is uniformly distributed over all homework assignments so far.)
- (b) Suppose that your friend has a similar strategy, except that when the k th homework is assigned, she switches to working on it with probability $1/2$. Describe the distribution of the homework assignment she is working on.