

Harvard University
Computer Science 121

Problem Set 0

Due Tuesday, September 10, 2013 at 11:59 PM.

Submit your solutions electronically on the course website, located at <http://people.seas.harvard.edu/~salil/cs121/fall12/>. On the site, click the "Problem Set Submission" button and provide your login info. Once logged in, place the solutions to Parts A and B, in separate files named lastname+ps0a.pdf and lastname+ps0b.pdf respectively, in the appropriate dropboxes.

See syllabus for collaboration policy.

Note: This is our standard prologue. Problem set 0 counts 0 points, but you should complete it, and we will grade it and provide a solution set for your edification.

PART A (Graded by Gabe)

PROBLEM 1 (2+2+2+2 points)

Using set notation, give formal descriptions of the following sets:

- (A) The set containing no elements.
- (B) The set containing the empty string.
- (C) The power set of a set X , denoted $\mathcal{P}(X)$, i.e., the set containing all subsets of X .
- (D) The difference between two sets X and Y , denoted $X \setminus Y$, i.e., the set containing all elements of X that are not elements of Y .

PROBLEM 2 (10+10 points)

Given a set X , we define the power set $\mathcal{P}(X)$ to be the set of all subsets of X .

- (A) Construct a bijection between $\mathcal{P}(X)$ and the set of functions from X into the set $\{0, 1\}$.
- (B) Prove that for any finite set X , $|\mathcal{P}(X)| = 2^{|X|}$. (Hint: use induction on $|X|$.)