

CS 2104 Homework Assignment 5. individual work

You MUST provide explanations: zero points without explanations.

YOUR FULL NAME:

1. Problem 1 (15 points).

You have a set of N elements. You choose, at random, a subset of it. Then, independently, you choose another subset of the original set of N elements. There are no limits on the size of either of the subsets, each can contain anywhere from zero to N elements. Neither size is specified. What is the probability p that the second subset is a subset of the first? Eliminate (cross out) as many wrong answers as you can from the list below, and briefly explain why next to each. Remember that an empty (zero elements) set is a subset of any set, and a set is obviously a subset of itself.

a) $1/N$

b) $(\frac{3}{4})^N$

c) $(1 + 1/N)^N$

d) $(1 + 1/N)^{-N}$

e) $(\frac{1}{2})^N$

f) $p > \frac{1}{2}$

2. Problem 2. (15 points)

Optimal packing of complex-shaped objects is a hard problem, but can sometimes be solved by clever algorithms (and excellent body mechanics). **Prove** that even if all of the faculty members of Computer Science at VT (40 professors!) put their heads together, they still will not be able to design a packing algorithm that would allow them to *simultaneously* fit into an average telephone booth. Assume booth dimensions of $1 \times 1 \times 2$ meters. Further assume that professors are average people: weight 70 kg, height 175 cm, arm span 1.5 m.