

Problem of the week #1:

Given - Jan. 16, 2003; Due - Jan. 23, 2003 (in class).

A prison has three prisoners A, B, and C. A prison warden has *randomly* picked one prisoner among three to go free. The other two will be executed. The guard knows which one will go free but is forbidden to give any prisoner information regarding his status. Now, prisoner A somehow learns that one of them has been pardoned and asks the guard privately which of B or C will be executed, arguing that since he (A) already knows that one of them must die, the guard won't be revealing any information about his (i.e., A's) status. The guard thinks about the argument of A and then tells A that B is going to be executed. Now A feels happy since he calculates that his probability of survival has increased.

(a) Is A justified in being happy?

(b) The guard did not know that A could communicate to C in an adjacent cell by tapping in code on a water pipe (!) This A proceeded to do, explaining to C what he had said to the guard

and what the guard had said to him. C was equally overjoyed with the news because he figured that his survival probability has increased. Is C justified in being happy?

Justify your answers to both parts by giving precise probability arguments. Also calculate the survival probabilities of A and C.