Homework 4

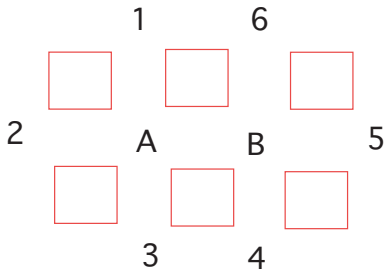
Due: Monday, September 30

1. Monty-Hall problem: Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice? Write a matlab program that can test this situation. We need to compare two scenarios, one where the contestant never switches and one where the contestant reconsiders and switches, a rough algorithm could look like this:

   (a) Run a 1000 gameshows
   (b) put the car behind a door: `pick random number and select 1,2, or 3`
   (c) contestant picks a door: `pick a random number 1 or 2 or 3`
   (d) pick a random door to reveal to the contestant: `pick a door that does not hide the car and that is not the choice of the contestant`
   (e) `record whether the contestant is right, without changing the door`
   (f) `record whether the contestant is right by changing the door`
   (g) Go to (a)
   (h) Report your findings

2. In this problem we consider a modification of the drunken sailor problem. Assume we have a town consisting of $m \times n$ blocks. We have illustrated the case below with 3×2 blocks. The sailor starts at crossroads and he is equally probable to go in any of the four directions. For the case of a 3×2 town the probability that he will leave through exits 1,2, or 3 is 0.266667 and through exits 4,5,or 6 is 0.066667 assuming he starts at crossroads A. For a discussion on how to compute the exact probabilities see
   http://www.chem.uoa.gr/applets/AppletSailor/Appl_Sailor2.html

   (a) Use a random walk in two dimensions to estimate the probability of each exit for a 3×2 town. Output your results and corresponding errors for N = 100, 1000, 10000, 100000.
   (b) Modify your code to simulate a 3×3 town. Output your approximate probabilities for the values of N in part (a).



Peter Beerli, September 2013