COMP1140 Assignment Three, 2009

Due: Friday 16 October

Late penalty: 20% per day

All questions have equal value. Please submit your assignment to Dr Huang by email (**jinbo.huang@nicta.com.au**).

Question 1

Suppose we start at the lower-left corner of a chessboard and move to the upper-right corner, making moves that are each either one square up or one square right. In how many ways can we make the journey?

Question 2

If we toss 12 coins in sequence, how many possible sequences will have

(a) at least 9 heads

(b) at most 4 heads

(c) between 5 and 7 heads

(d) fewer than 2 or more than 10 heads?

Question 3

A bridge hand consists of 13 of the 52 cards. Count the number of bridge hands with the following distribution among the four suits: (a) 4-3-3-3, (b) 5-4-3-1, (c) 4-4-3-2, (d) 9-2-2-0. Note that the order of suits does not matter.

Question 4

Consider a match of 7 games between two teams, won by whichever team wins at least 4 games. Both teams are equally likely to win each game. Compute the probability that a team will win the match, given that it has won (a) the first two games, (b) two out of the first three games.

Question 5

A graph is a set of nodes plus a set of edges, where an edge connects some pair of nodes. A triangle, for example, has 3 nodes and 3 edges. Consider the following Monte-Carlo algorithm for determining whether a graph contains a triangle. Pick an edge AB at random (the edge that connects nodes A and B), and pick a node C other than A and B, at random as well. Declare that the graph has a triangle if and only if edges AC and BC both exist in the graph. Assume that a given graph has n nodes, e edges, and either no triangle or exactly one triangle. For each of the two cases, compute the probabibilty that the algorithm answers incorrectly.