# CSE 6331 Homework 6

Due: Tuesday, February 27 by class time

For each problem you should give a complete solution, including a function definition, recurrence relation, boundary condition, goal, and a *nonrecursive* algorithm.(You don't need to print the actual solution.) You should also give the asymptotic running time of your algorithm.

1. Consider an $m \times m$ chessboard with an integer written on each cell of the board. A pawn starts out in the first column and first row and advances one row at a time to the last row. To advance, the pawn may move forward one row along a column or a diagonal. Thus a pawn in row $i$, column $j$, can move to columns $j-1$, $j$ or $j+1$ in row $i+1$. The weight of a move is given by the integer on the cell to which the pawn moves. The weight of a sequence of moves is the sum of the weights of each move (including the weight of cell (1,1)).

   Describe an algorithm which computes the minimum weight sequence of moves by which a pawn can advance from the first to the last row. (It will simplify your solution if you introduce two additional columns, column 0 and column $n+1$, with an infinite weight on each cell.)

2. Let $A = a_1 a_2 \ldots a_m$ and $B = b_1 b_2 \ldots b_n$ be two strings of characters. We want to transform $A$ into $B$ using following operations:

   - delete a character
   - add a character
   - change a character

   Write a dynamic programming algorithm that finds the minimum number of operations needed to transform $A$ into $B$.

3. $N$ jobs are to be scheduled for processing on one machine. Job $i$, $1 \leq i \leq N$, needs $t_i$ units of processing time. If job $i$ is finished by time $T$, where $T$ is a given deadline, then a profit $p_i$ is earned; otherwise, a penalty $q_i$ is imposed. (Both $p_i$ and $q_i$ are positive integers.) We want to select a subset $S$ of jobs such that
   (i) $\sum_{i \in S} t_i \leq T$, and
   (ii) $f(S) = \sum_{i \in S} p_i - \sum_{i \notin S} q_i$ is maximum.
   Show how to find such a set of jobs using dynamic programming.