

Coding Project – Dynamic Programming

Due Date: March 17th, 2019

Instruction

Choose **two** of the following problems and use dynamic programming to solve them. Please write your code in Java. When submitting, please submit your original code file, not pasting them to word document or pdf. *This is a group project, only one submission is needed per group.* Extra points will be given to better interface.

House Robbing

You are a professional robber planning to rob houses along a street. Each house has a certain amount of money stashed. All houses at this place are arranged in a circle. That means the first house is the neighbor of the last one. Meanwhile, adjacent houses have security system connected and it will automatically contact the police if two adjacent houses were broken into on the same night.

Given a list of non-negative integers representing the amount of money of each house, determine the maximum amount of money you can rob tonight without alerting the police.

Example:

Input: 2, 3, 2

Output: 3

Input: 1, 2, 3, 1

Output: 4

Wildcard Pattern Matching

Given a string and a pattern containing wildcard characters, i.e. '*' and '?', where '?' can match to any single character in input string and '*' can match to any number of characters including zero characters. Design an efficient algorithm to find if the pattern matches with the complete input string or not.

Example:

Input: string = "xyxzzxy", pattern = "x***y"

Output: match

Input: string = "xyxzzxy", pattern = "x***x"

Output: no match

Input: string = "xyxzzxy", pattern = "x***x?"

Output: match

Maximum Points

Consider a row of n coins of values v_1, \dots, v_n , where n is even. We play a game against an opponent by altering turns. In each turn, a player selects either first or last coin from the row, removes it from the row permanently and receives the value of the coin. Determine the maximum possible amount of points we can definitely win if we move first.

Note: the opponent is as clever as the user.

Example:

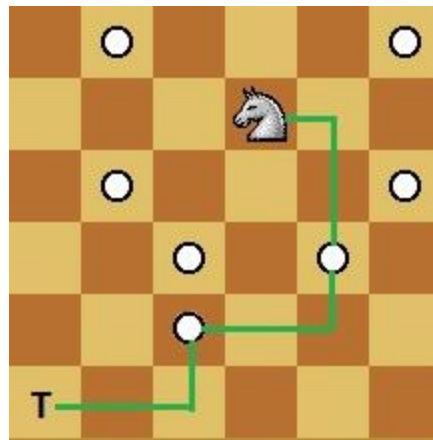
Coins: 5, 3, 7, 10 User collects 10 and 5, gives maximum points: 15

Coins: 8, 15, 3, 7 User collects 7 and 15, gives maximum points: 22

Chess

Given a square chessboard of $N \times N$ size, the position of Knight and position of a target is given, the task is to find out the minimum steps a Knight will take to reach the target position.

Example:



Knight position at (4, 5).

Target position at (1, 1).

Number of steps: 3

(4, 5) -> (5, 3) -> (3, 2) -> (1, 1)