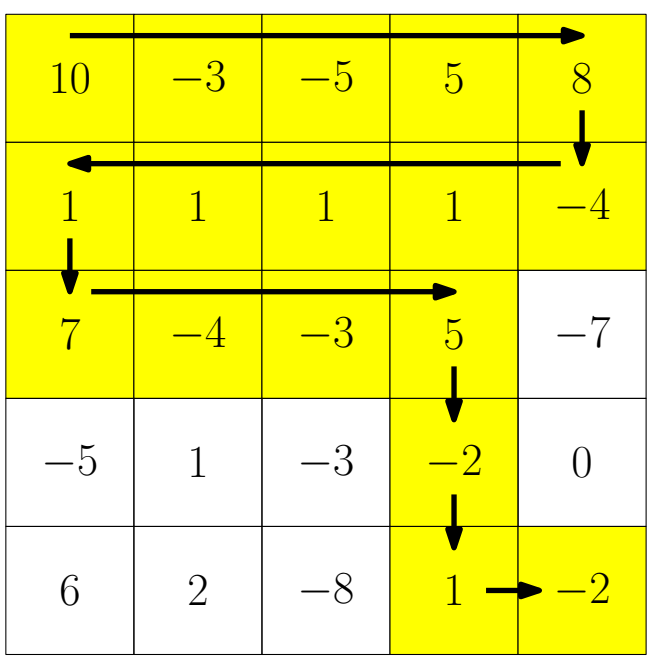
Homework 4 Due: 12:59 pm, May 18, 2023

Problem 1 (2 pts) Assume that coins are in denominations of 1, 4 and 6 Won in a country. Given an amount of money, you are to compute the minimum number of coins of which sum is equal to the amount. Formulate this as a dynamic programming problem by providing a definition of a subproblem and a recurrence relation among subproblems.

Problem 2 (3 pts) Suppose you are given an array $M[1...n, 1...n]$ of numbers, which may be positive, negative, or zero and which are *not* necessarily integers. Describe an efficient algorithm to find the largest sum of elements in any rectangular subarray of the form $M[i...i', j...j']$ and analyze the running time.

Problem 3 (4 pts) On an n by m grid G, there is a robot that can move left, right, or down. The robot is located at the top-left corner of G and it cannot change its direction from left to right or right to left. Each cell of G contains a value (possibly negative) and the robot gets the value if it reaches the cell. Describe an efficient algorithm that computes a path ending at the bottom-right corner of G that maximizes the sum of values the robot gets. (In the example below, the arrows and yellow cells show the optimal path and its sum of values is 17.)



Problem 4 (6 pts) Suppose we are given a set L of n line segments in the plane, where both endpoints of each segment lie on the unit circle $x^2 + y^2 = 1$, and all $2n$ endpoints are distinct.

(a) (3 pts) Describe and analyze an efficient algorithm to compute the largest subset of L in which no pair of segments intersects.

(b) (3 pts) Describe and analyze an efficient algorithm to compute the largest subset of L in which every pair of segments intersects.