K. N. Toosi University of Technology

Algorithm Design Course
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Marshall Eriksen's Dance-off

June 03, 2021

Overview

Little Marshall was bullied yesterday in the playing yard , as it's clear to everyone he loves dancing, so to come back at those bullies , he invites them to a dance-off, Rules of the dance-off are as follows:

- Each team is allowed to use ***n*** dancers in the battle.
- There is a dance floor which has more than or equal to ***2n*** squares.
- Each square has a score that the dancer who's dancing on it will get for his/hers team.
- The score for the whole team is the sum of the scores that each of its dancers will get.
- **The 2 teams take turns in adding dancers to the floor** but there is a simple rule :
- **The new dancer can only dance next to an existing dancer, or next to the edge of the dance floor.**
- **Team Marshall will start first.**
- Match will continue until all the dancers are on the dance floor.

Let's see an example for better understand but for the record consider that:

(🟥) represents Marshall's team and (🟦) This represents the bullies team.

In this example :

n = 3 , number of dance floors = 6 and also scores of each square is specified below.

The Floor & Scores	5	7	3	4	4	6
Round 1	🟥					
Round 2	🟥	🟦				
Round 3	🟥	🟦				🟥
Round 4	🟥	🟦	🟦			🟥
Round 5	🟥	🟦	🟦	🟥		🟥
Round 6	🟥	🟦	🟦	🟥	🟦	🟥

At the end of this dance-off, team Marshall has a score of 5 + 4 + 6 = 15, while the bullies have a score of 7 + 3 + 4 = 14, so team Marshall wins. (Consider that the given example is not an optimal strategy).

Obviously, Marshall is the captain of the team so he should decide to send his dancers to a square that he thinks is better, Help Marshall to get the best score he can.

Goals

1. **Design a Dynamic Programming Algorithm** that can help Marshall win this battle .

How to take input?

Declare that :

- How many dancers are in the battle?
- How many squares does the dance floor have?
- What's the score of each square in the dance floor?

YOUR APPROACH WILL NOT BE ACCEPTED IF IT'S NOT DYNAMIC PROGRAMMING.