NON-LINEAR DATA STRUCTURES AND ALGORITHMS.
ASSIGNMENT 2

IMPORTANT: If you submit the top-down (recursive) approach you will get 0 marks (only for exercise 1). If you solve the problem using an algorithm that is not Dynamic Programming (such as using only recursion), you will get 0 marks. If you solve the problem with Dynamic Programming for a specific number of n but you do not generalize it to any n number, you will get only 20 mark.

Part 1: Paper roll cutting

1. Background.

Consider that you are working for a paper rolls company. You have to implement a program that given a paper roll of length n computes the best revenue (highest value) of cutting the roll on several roll-pieces and selling them.

There are **ONLY** 4 possible lengths of roll-pieces:

- Roll-piece of length 1 with price 1.2€
- Roll-piece of length 2 with price 3€
- Roll-piece of length 3 with price 5.8€
- Roll-piece of length 5 with price 10.1€

2. Goal of the Assignment
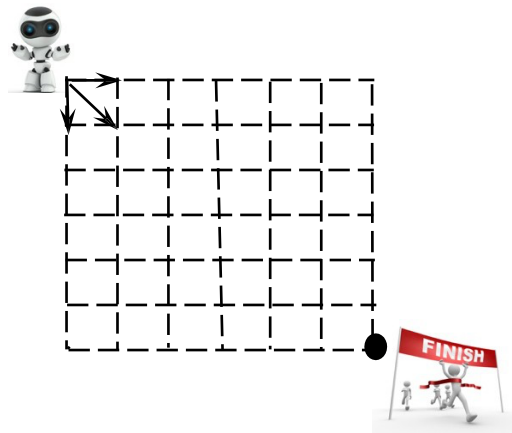
NON-LINEAR DATA STRUCTURES AND ALGORITHMS.

ASSIGNMENT 2

Implement the dynamic programming **bottom-up (iterative)** approach in Java of the rod cutting problem that we studied in the lectures. The name of your Java file must be: **PaperRollCuttingBottomUp.java**. For any length *n* of a paper roll, the Java file has to print on the screen the best revenue in € and how many roll-pieces of each type were cut for obtaining such revenue.

Part 2 : Robot moving until finish point

1. Background.

You are working for a company that creates robots and you have to code the software for solving the problem of moving the robot until the finish point by consuming the minimum cost of energy for the robot. Please, look the picture below. The robot can ONLY move to the right, down and diagonal-down. As input there is a parameter *n*, which indicates the matrix of *n*x*n* that represents the space. Note that the robot is originally placed in the left-up part of the matrix and the finish point is in the right-down part of the matrix.

The energy costs of the robot moving are (two groups of costs: Cost1 and Cost2):

Movement	Cost1	Cost2
Right	1.1	1.5
Down	1.3	1.2
Diagonal (Right-Down)	2.5	2.3

NON-LINEAR DATA STRUCTURES AND ALGORITHMS.

ASSIGNMENT 2

2. Goal of the Assignment.

Implement the dynamic programming bottom-up or top-down approach (as you prefer) in Java of the robot moving until reaching the finish point. The name of your Java file must be: **RobotMoving.java**. For any size of the matrix *n*, the Java file has to print on the screen the minimum cost of reaching the finish point and the movements done by the robot until reaching such point (e.g right, down, right-down, right, down, down, down, etc.). The program should consider Cost1 and Cost 2 separately and shows two solutions (one considering Cost1 and another using Cost2)

MARKS BREAKDOWN.

Assignment 2: 100 marks

Part 1: 60 marks
Part 2: 40 marks

To evaluate the assignment, I will run it over some tests on different *n* (run your software and check that the outputs are correct!). Also, as always, remember to print the error messages. The results are based on the performance of your code over these tests.

IMPORTANT: I will use a source code plagiarism detection tool. In case of detecting a copy (for at least one method) between some students, all these students get 0% marks for the whole assignment. Including the student that originally coded it.

SUBMISSION DETAILS.

Deadline: 25 April, 2021

Submission Details: Upload to Canvas **ONLY** the following files:

> **PaperRollCuttingBottomUp.java**
> **RobotMoving.java**

NON-LINEAR DATA STRUCTURES AND ALGORITHMS.

ASSIGNMENT 2

IMPORTANT: Do not ZIP the files.

Lab Demo:

A brief individual interview about the assignment will take place on a mutually agreed date (end of April, 2021). **The demo is mandatory for the assignment to be evaluated.**

Once the demo is done, there will be no possibility of re-evaluating later. The evaluation will be done with the exact code presented at this moment. Therefore, my advice is to take this option only if you are 100% sure that your assignment is already completed.