Assignment 1

The Knapsack problem (BKP) is a problem in combinatorial optimization. This problem is described as follows:

Given a list of items, each item has a weight and a benefit, determine the number of each item to include in a bag so that the total weight is less or equal to the limit of the bag and we get the maximum benefit.

The most common problem to solve is the 0-1 knapsack problem, which restrict the number of copies of an item to one. So an item can be inside the bag or outside.

We now consider the problem with a set of items (you can find the document in the same folder in the blackboard and the name is 0_1_knapsack.bkp).These items are represented by 2 values (weight and benefit) as illustrated in the table below.

Item ID	Benefit (b)	Weight (w)
1	20	15
2	40	32
…	…	…

What to do: Your assignment now is to apply Breadth-first searh (BFS) and Depth-first search (DFS) to search for the best combination of items inside the bag. **Remember, only one copy of an item.** You need to use a tree (queue or stack depending of the algorithm)(**DO NOT IMPLEMENT THE TREE FIRST AND THEN SEARCH**) and nodes in order to implement both search strategies. You need to present both codes to the teacher. **(1 point each code)**

Your report has to cover the key parts as follows:

1. - Explanation of the problem. **(1.5 point)**
    a. Give the representation of a solution (answer) of the problem.
    b. Give the equation of the objective function (what we want to maximize).
    c. Give the equation for the restriction(s) of the problem.
2. Comparison of the algorithms. **(1.5 point)**
    a. Time complexity comparison (or time comparison).
    b. Space complexity comparison (or space comparison).
    c. Comparison of the first solutions found by the algorithms (not necessary the best).

Maximum Score: 5 points.

Soft Deadline: 11 February 2018.

Hard Deadline: 18 March 2018.

Before submitting the report, you should present this assignment first to Miguel Leon. After that, and only if everything is correct, you are able to send the report to Miguel.leonortiz@mdh.se