DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY

Algorithm Laboratory (CSLR41)

Assignment 6

Problem Statement: Given a set of items, each with a weight and a value, determine which items to include in the collection so that the total weight is less than or equal to a given limit and the total value is as large as possible.

Condition: Consider both the cases

a) when the item has to be taken as a whole and

b) when you are allowed to take *some* parts of the item

Input: A number *n* of items - the program should generate random weights and corresponding values for each of the *n* items and the limit of total weight W.

Tasks:

1. For each of the conditions find the items to be taken along with the weights of those items to maximize the value corresponding to the total weight limited by W.
    a. For small *n*, print the intermediate steps as you calculate by hand.
2. Compare the performance of these two different algorithms:
    a. Check for different *n* in the range of 100 to 10000.
    b. Plot and find the time complexity in terms of asymptotic notation by varying input size and noting down the time required to solve this problem.
    c. Find a function *g(n)* and the associated constants for which the plot is bounded above and by *g(n)* for each of the algorithms.
3. Which algorithm will work better and in which situation(s)? Can you define the worst case situations for each scenario? Write your observations and derive possible conclusions.