Programming Assignment 2

Maximize Profit

CECS 328 – Fall 2023

Due: Friday, October 6 at 11:59 pm

Points Possible: 10

Problem Statement:

Imagine your name was chosen in a raffle and won the ability to go to your favorite store and take anything you wanted, for free. Only constraint is that you have a shopping cart that is of finite capacity. In other words, you can only take things such that it does not exceed the weight capacity of the shopping cart. You cannot take fractions of items either (i.e. if you want to take an item, you must take the whole item, not a part of it).

With your algorithm skills, you want to maximize the total value of items taken from your favorite store, but not exceed the weight capacity of the shopping cart.

Fortunately, you will be getting the list of all of the products in the store, along with their weight and fair market value. A CSV file will be provided to you with two columns: first column has the weight and the second column has the value. You can assume all values in each column are unique.

You aren't sure what the weight capacity of the shopping cart is yet, so you must have this be a value that can be inputted (not hard coded). In addition, the CSV file should also not be hard coded.

Write up a program in Python that will take in a CSV filename and shopping cart weight capacity, and output the maximum value of items you can take such that the weight capacity is not exceeded. In addition, output the list of all of the weights of items that you should take.

Regarding libraries, you may only have the following import statement in your code:
import csv
import sys

The input CSV file should be located in the same directory (aka folder) as your code (pa2.py). The input CSV filename should be able to be passed in via the command line. See the "Examples" section below.

Submission Requirements:

Failure to follow any of the requirements in this document (items listed below or above) will result in point deductions, up to and including receiving zero credit.

1. Write your name as a comment at the top of your code.
2. The filename of the code that you submit should be: **pa2.py**
3. Your program must be able to be executed via the Python command line (see the "Examples" section below).

4. You can only import the following Python libraries:

csv

sys

5. You can work with other students or individually, up to you. However, you must submit your assignment individually on Canvas.
6. You must submit your file on Canvas. Any other submission method (such as email) will be rejected and you will receive zero credit. As mentioned in the syllabus, only submissions on Canvas will be accepted. If you forget to submit and your file is in some other location (e.g. GitHub) instead, I still will not accept it (no exceptions).
7. The programming language must be the same as what is mentioned in the syllabus.
8. Do not put your Python functions in a class (e.g. "`class Solution:`"). This will prevent our testing script from executing on your program and you will end up getting a zero. You will get zero credit if you do this.
9. Do not have any print statements in your code other than what is indicated in this document. If you do, your program will fail the test cases and you will get points deducted, up to and including receiving zero credit on your assignment.
10. Canvas will automatically add a hyphen and a number to the file name if you upload the same file more than once. That's fine and don't worry about it, I will not deduct points for that.

Examples:

The below are run from the Python command line. This is how your code will be graded. Your program absolutely needs to be able to be run from the command line, otherwise you will get zero credit.

Two sample input files are provided to you on Canvas so that you can test your code against. Note that getting the same output as the below will not guarantee full credit on this assignment, as these are just test files. You can create your own test file(s) to test out various scenarios. It is up to you to make your code as robust as possible.

>python pa2.py input-pa2-small.csv 10
Max value of items taken is 11. Array of weights of items taken is [2, 1, 3]

>python pa2.py input-pa2-large.csv 5000
Max value of items taken is 385031. Array of weights of items taken is [141, 85, 76, 168, 81, 181, 6, 48, 33, 8, 26, 60, 32, 172, 194, 169, 3, 57, 42, 86, 176, 41, 103, 44, 109, 29, 21, 62, 49, 97, 45, 112, 142, 82, 52, 83, 125, 40, 38, 28, 98, 132, 155, 136, 67, 34, 39, 14, 119, 130, 87, 116, 51, 55, 31, 126, 100, 37, 68, 184, 11, 64]

What to submit:

- You should only submit the following file: pa2.py

Constraints:

- Values in the CSV file are positive integers, between 1 and 11,000.
- Each column in the CSV file has unique values.
- Shopping cart weight capacity will not be greater than 5,000.

- Input CSV file may be up to 5,000 rows.
- Your code must complete within 5 seconds.

Grading Guidelines:

- Does the program meet the requested requirements/criteria?
- Are the submission instructions followed?
- Does your code compile and execute?
- Does your code pass my test cases? I will not share my test cases with you. However, I have provided examples, as mentioned above, so that you can test your code against.