Exercise #3 Spec

Due Date: 2024/01/16 23:59:00

Resource Allocation Problem

- ✔ Given m resources and n projects, a profit(i, j) will be obtained if j, $\mathbf{0} \leq \boldsymbol{j} \leq \boldsymbol{m}$, resources are allocated to project i.
- ✔ Find an allocation of resources to maximize the total profit.
- ✔ Must use a dynamic programming approach to design an algorithm and implement the program to solve the resource allocation problem.

e.g. You have 7 days to study four courses. Each course should study **AT LEAST** 1 day, and **NO** course can be studied twice. How to plan your schedule to get the highest score?

Score(profit)		course(c)			
		1	2	3	4
Days to study (r)	1	3	4	3	6
	2	6	6	4	7
	3	7	9	8	9
	4	8	11	9	10

Answer: highest score is 24 (6+9+3+6).

P.S. If you study course 1 two days, you will get 6 points;If you study course 2 three days, you will get 9 points;If you study course 3 one day, you will get 3 points;If you study course 4 six days, you will get 6 points.

Input:

The first line of input t denotes that there are t test cases in the following inputs.
For each test case, the first two inputs r, c denote the profit table with r rows and c columns. c means the course number, r means how many days you study. The following r*c elements in the profit table PT means the profit (the points) you get when you study c course for r days.
The next input q denotes the number of queries.The next q line each contains an integer d that the days you have for studying for each query.

Output:

For each test case, output a line containing a single integer for each query, the highest score you can get for studying total d days corresponding to Profit table PT.
Do not use Tab as space.The line breaks are represented as '\n'.

Sample Input:
2
4 4 (Profit table 1 with 4 rows and 4 columns)
3 4 3 6
6 6 4 7
7 9 8 9
8 11 9 10 (Profit table **1**)
2 (Numbers of query)
7 (Days for studying; corresponding data as for Profit table **1**)
5 (Days for studying; corresponding data as for Profit table **1**)
4 3 (Profit table **2** with 4 rows and 3 columns)
3 4 3
6 6 4
7 9 8
8 11 9 (Profit table **2**)
2 (Numbers of query)
6 (Days for studying; corresponding data as for Profit table **2**)
4 (Days for studying; corresponding data as for Profit table **2**)

Sample Output:
24 (6+9+3+6)
19 (6+4+3+6)
18 (6+9+3)
13 (6+4+3)

(Only provide the means of input and output. Please check the format of attachment testing dataset D1 display.)

Rules of programing and the datasets:

(1) Resources is larger than number of plans (Because one plan need to choose once)
(2) One profit table may contain more than one allocation problem
(3) All element types are positive Integer (int range).
(4) $0 < t <= 15$, $0 < r, c, d, q <= 50$.
(5) You can only use standard header files.

Exercise #3 Submission Policy

A. Language

C, C++

(Please check your program can compile successfully by gcc/g++)

B. Input / output Format

Please refer to **Sample input/output** on the previous page and attachment **testing dataset D1**(input.txt and output.txt).

The line breaks are represented as '\n'.

請遵循testing dataset D1輸入輸出的顯示格式，包含空行、文字、空白等資訊，否則會算ouput format error。

C. Submission File

1. Main program
   - You should name your file as Exercise3_STUDENT_ID.c / Exercise3_STUDENT_ID.cpp.
   - Your program should use standard input / output. Do not read / write the text file.(testing dataset D1 僅供輸入輸出格式查看，請使用standard input/output)
2. Report
   - You can write in Chinese and English and the content must include:
     - Environment (OS, compiler version, IDE) (1%)
       - How to run your program
     - Results (4%)
       - Method or solutions
       - Anything you want to share

Please hand in your main program and report to the e3 platform.

(Do not compress files)

1. Exercise3_STUDENT_ID.c / Exercise3_STUDENT_ID.cpp
2. Exercise3_STUDENT_ID.pdf

ex: Exercise3_123456789.cpp

D. Score

There will be 3 testing datasets: D1, D2 and D3. D1 is provided in input.txt and output.txt

- Pass D1: 60%
- Pass D2: 20%
- Pass D3: 20%
- Report: 5%

Total: 105

Penalty

- not use standard I/O -10 pts
- testing result output format error -5 pts
- filename error / submit compressed file -5 pts

- If you have submitted Exercise #3 but your grade is below 60, you will have one opportunity for a makeup submission **within three days** of the Exercise #3 grade release. The maximum final grade achievable through makeup submission is 60

points.

E. Cheating Policies

- 0 points for any cheating on assignments.
- Allowing another student to examine your code is also considered cheating.

F. Late Submission

- Every 4 days late from the due day will get a 10% penalty.
  For example, if you submit the homework on 01/16 23:59:01 - 01/20 23:59, your final score will be multiplied by 0.9. And if you submit it on 01/20 23:59:01 - 01/24 23:59:59, your final score will be multiplied by 0.8.
- late submission after 01/25 00:00 will be 0 points.

G. Asking Questions

- If you have any questions, you can choose from the following options:
  - **Email TAs**: It is recommended to email all TAs to avoid any potential issues with missing responses.You can send email through E3 mail system or gmail.
  - **Exercise #3 E3 Forum**: Post your questions on the Exercise #3 E3 forum for discussion and assistance.
  - **In-Person Assistance**: Come to EC126 after informing TAs.

- Remember that TAs may not always be able to respond instantly. It's suggested not to wait until the due date to ask questions.

- All TA responses in the HW3 discussion forum will adhere to the specifications outlined in this document.