TI-Concours 2017

Task 3
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Masterpieces

Foreword

You have until April 23rd 2017, 23:59 (UTC+2) to send your production at the following e-mail address: info@tiplanet.org. The title should be "TI-Concours, Task 3", and in the message body you should write your first name, last name, full mailing address, and the name of the calculator that you used for this task. Don't forget to attach your programs, which should be put all together in a single ZIP or RAR archive, which name should be your family name in uppercase letters without accents, followed by a space and the number "3". This archive should contain all the programs you made for this task (and nothing else).

You may update your submission as much as you need, by sending a new e-mail as stated above. Only the last e-mail that was sent before the deadline will be taken into account.

For this task, your main program should have the following name: the first 5 letters of your family name, without spaces or accents, followed by "3". For example, if your family name is De Périgny, your main program should be called "DEPER2". By doing this, you reduce the risk that we get two programs with exactly the same name. Yet, if you know someone whose family name has the same 5 first letters as yours and might participate, don't worry, we will handle this case by ourselves.

For this task, sub-programs are allowed: their names should start with the same six characters as the main program's, and should end with one or two extra characters of your choice. Recall that the main program is the one that should be chosen by the user when running the program. You may not ask the user to run an "installation" program prior to the first use of the program strictly speaking.

Your programs must all be fully written in z80 or ez80 TI-Basic. It means that you may use neither external librairies nor assembly code. We would also ask you not to protect your code, as we judges would like to see in detail what you did exactly.

Don't forget to get a link cable that lets you send programs from your calculator to your computer, and install the required software to do this. If you are facing issues related to this, do not hesitate to ask question on http://tiplanet.org.

If there is anything that you don't understand in this document, you may ask question at any time on http://tiplanet.org, by sending a private message to the user whose handle is "noelnadal". If it occurs that something really needs to be clarified, this document might be updated on the website. Therefore, it is recommended a check regularly if something has changed or not.

Whatever happens, we hope you will have fun participating!

Good luck to everyone!

Masterpieces

Story

Alvoko is on well-known artist on TI-Planet: everybody wants to buy his paintings. As a consequence, despite the fact that he paints really fast, he cannot fulfill all purchase orders.

While his reputation was quickly growing up, Alvoko selected a few models that he used to make, according to what his fan-club liked the most. Now, we only makes these ones, and always sells them at the same price.

Every Sunday, Alvoko retrieves the (long) list of purchase orders that he got during the whole week, and takes care of deliveries, so that everything is ready to be sent on Monday morning. As said before, Alvoko receives too many orders, and cannot fulfill all of them. Hence, he decided that from now he would chose which customers he would send his precious work, so that he can maximize his profit. Note that he doesn't need to fulfill as many orders as possible, he can even send nothing if he wishes to.

Since a recent decision by the COWH, the Committee of Observation of the Whims of Hayleia, it is not necessary to give one's mailing address to get what one orders anymore. More precisely, it is possible to ask the order to be delivered in a TPPO (TI-Planet Post Office). The customers can then go get the delivery by himself.

However, it sometimes happens that some employees are temporarily kicked from TI-Planet by moderators. In this case, these employees keep with them the packages they were supposed to deliver, and thus customers cannot receive them. Therefore, when Alvoko sends a package he must always acquire one of the insurances that are available on TI-Planet. Each insurance has a price, but lets all the paintings contained in a package with a price lower than (or equal to) the insurance's specific ceiling to be refunded.

Fortunately, Alvoko has the right to group several deliveries into the same package, and send everything to the same place, assuming that the number of paintings is no greater than 42 (otherwise it doesn't fit in the delivery truck). However, if a customer gives his real mailing address and still has to go in a TPPO to get what he ordered, Alvoko has to make a discount for him, which percentage is equal to the flying distance between this office and the customer's home. The order est completely refunded in cas this distance exceeds 100. A given order cannot be sent to a home else than the customer's one.

If a customer that didn't give his mailing address has collect his order in another TPPO than the one he told Alvoko, then the flying distance which is taken into consideration is the one between these two offices. If a painting that was ordered by several people is sent to a TPPO, then Alvoko choses the customer who should claim the smallest discount and asks this customer to go retrieve his order.

Alvoko is really challenged by this problem. Will you be able to help him ?

Your task

In this task, you do not have to ask the user t do anything: when your program will be ran, some variables will already be filled with specific values.

N will contain the number of models of paintings that Alvoko sells. It will always be between 1 and 100.
L_1 will contain their prices. They will always be between 0 and 100000.
L_2 will contain the number of copies Alvoko has for every model of painting. These numbers will always be between 0 and 1000.

L will contain the cost of sending a package. This cost depends neither on the distance travelled by the package, nor on its weight or size. It will always be between 1 and 1000.

P will contain the number of TPPOs. It will always be between 0 and 500.
C will contain the number of customer's addresses Alvoko knows. It will always be between 0 and 500. Furthermore, C+P will always be between 1 and 500.
L_3 and L_4 will contain TPPOs' and customers' coordinates. Their values will always be between -1000 and 1000. The P first coordinates are TPPOs', the next C ones are the customers'.

R will contain the number of orders. It will always be between 1 and 500.
L_4 and L_5 will contain respectively, the number corresponding to the model that has been ordered, and the number corresponding to the place where it should be delivered. The first number will always be between 1 and N, and the second number will always be between 1 and C+P.

A will contain the number of insurances that exist on TI-Planet. I will always be between 1 and 10.
L_6 will contain the ceilings below which insurances can refunds paintings that were in a lost package, followed by the cost of such insurances. This numbers will always be between 1 and 100000. For example, the ith insurance's ceiling will be $L_6(i)$ and his cost will be $L_6(i+A)$. One shall suppose that the prices are coherent, that is the more the price is important, the more the ceiling is high. One can also assume that there exists at least one insurance that can refunds every package Alvoko is able to make.

Coordinates are cartesian ones: one can assume that TI-Planet is similar to a plane, and that coordinates (X, Y) are defined according to a given orthonormal mark. The flying distance between two points (A, B) and (C, D) is defined as the square root of $(A-C)^2 + (B-D)^2$.

When your program stops running, results should be put in the matrix [A]. Every line should correspond to a package that is sent by Alvoko. The first column will contain the index that corresponds to the place where the package is sent. The following columns should contain, in any order, the indexes of the paintings that are in the package. Since a matrix on your calculator will require all lines to have the same length, the number of columns of your matrix should be equal to the maximum number of paintings in a package, plus the one stating where the package should be delivered, and incomplete lines should be filled with « -1 »s at the end, if required. The packages are sent in the order they are described in the matrix.

Please note that your program does not have to display anything on the screen.

Judging

Every program taken into account for this task will first receive a score, between 0 and 100 inclusive. It will be tested on 10 different inputs, and each valid answer will give 3 points. Then, 20 points will be given according to how fast the program computes the answers. The last 30 points will be given according to how high are the solutions' scores. At the end, all the scores will be harmonized, so that the average score is 60 points, and the standard deviation is 10 points.

For a given solution, its score is computed as follows: it is the sum of prices at which Alvoko's paintings are sold (taking into account last-minute discounts), minus the money Alvoko spent on insurances and sending packages. One can assume that for every sent package, the chosen insurance is the cheapest one that is enough for this package.

A solution will not be considered as valid if one of the following happens:

- a painting is sent to a customer's home, whereas this customer didn't order it;
- a painting is sent whereas Alvoko doesn't have any copy for this model anymore;
- the matrix does not meet the required format;
- Alvoko est in deficit, that is to say, he loses money (he may get a profit of 0);
- the program does not terminate correctly (i.e. an error occurs);
- the program spends more than 4 minutes computing a solution, on a CEmu emulator, with a TI-83 Premium CE OS 5.2.1 ROM.

Please note, that all programs will be tested on the same calculator. Before each program is tested, this calculator will be reset, to guarantee equity between participants.

Example

Input:

N = 2, L1 = {500, 1000}, L2 = {1, 1}.
L = 50.
P = 1, C = 2, L3 = {0, 1, 2}, L4 = {0, 1, 2}.
R = 3, L4 = {1, 3, 3}, L5 = {1, 1, 2}.
A = 1, L6 = {10000, 100}.

Voir la page suivante pour avoir une illustration.

Output:

The matrix [A] contains the following line.

1	1	2

Please note than there exists plenty of valid solutions, with different scores.

Atelier d'Alvoko

This time, Alvoko sends only one package, that contains the two paintings that he has in his workshop. The shipping fee is thus 50 for sending the package, plus 100 for the insurance, which makes a total of 150. The package is sent to the only TPPO that exists.

The first painting was ordered twice: once at the TPPO, once at the place with coordinates (2, 2) (customer 2). In the first case, Alvoko doesn't need to make any discount for the customer, so this customer can get the painting, and Alvoko makes a profit of 500.

The second painting was only ordered at the second customer's home. This customer must therefore travel to collect his order. The travelling distance is roughly 2.828 (square root of 8). The discount rate is therefore roughly 2.828%, and Alvoko makes a profit of approximately 971.72.

Hence, Alvoko wins 1471.72 and spends 150: the score for this solution is approximately 1321.72.