EQUIPTAL
NEXT GENERATION EQUIPMENT

Installation Requests Management
An Operations Optimization Problem

1 Introduction

Equiptal, a construction tech company, offers a suite of digitalized services to the construction industry. One of its standout services is Fleet Telematics.

Fleet Telematics uses trackers installed on equipment to collect telematics data. This data is then sent to Equiptal's data stores, where customers can use it to monitor and manage their entire fleet from a single web application.

Equiptal requires installation of a set of trackers on new customers' equipment upon signing a contract. However, as the fleet may be spread out over a large area and equipment may not always be available for installation, this process incurs high costs. Therefore, Equiptal aims to minimize the cost of the installation process as part of its operational problem-solving efforts.

The main cost of installing trackers is travel. Installation agents must travel from Equiptal's sites to the equipment's sites. To reduce costs, agents carry multiple trackers and perform multiple installations per trip. However, due to constraints such as equipment availability, the cost savings are often not significant.

2 Problem Statement

Equiptal has $|S|$ sites in the Kingdom of Saudi Arabia. Each site $s \in S$ is located at coordinates (x_s, y_s) and has $|A_s|$ agents who can work for at most T_s time units. Cars at each site have a maximum load capacity of C_s weight units. Each site is open from the s_s-th time unit to the e_s-th time unit.

A set of installation requests R is provided. Each request $r \in R$ corresponds to installing a tracker that weighs W_r weight units and requires T_r time units to install on an equipment located at coordinates (x_r, y_r). The equipment's driver will be waiting at that location starting from the s_r-th time unit. If the agent does not show up before the e_r-th time unit, the driver will leave the location.

Agent $a \in A_s$ is responsible for selecting a car from the site s when it is open, carrying the necessary trackers for installation, and starting the trip. It is essential that the agent returns the car to the site within its opening hours and does not exceed the maximum capacity of the car C_s. The agent should ensure that their entire trip does not exceed the allotted working time T_s.

The distance between locations is specified as the Euclidean distance, and the time required to travel a distance unit is precisely one time unit.

Agent a should initiate the installation process during the period $[s_r, e_r]$. If the agent arrives at the installation location before the start of this interval, they must wait for the equipment to become available before commencing the installation. If the agent arrives after the end of this interval, then the tracker will not be installed.

Every tracker is distinct and designated to a specific installation request. Therefore, it is not feasible for multiple agents to serve the same installation request. Only one agent is permitted to carry the equipment's tracker and install it.

Traveling between locations incurs the highest expenses as it consumes both agents' and cars' time, in addition to requiring fuel for the cars. Therefore, our objective is to assign requests to the agents in a manner that reduces travel time, thereby minimizing the associated costs.

3 Input Format

For each file, the first line contains 2 integers: $|S|$ and $|R|$ respectivly.

The next $|S|$ lines each corresponds to a site $s \in S$ and contains 2 decimals and 5 integers all space separated: x_s, y_s, T_s, C_s, s_s, e_s, and $|A_s|$.

The next $|R|$ lines each corresponds to an installation request $r \in R$ and contains 2 decimals and 4 integers all space separated: x_r, y_r, T_r, W_r, s_r, and e_r.

Sample input:

```
1 2
4.0 3.0 5 5 0 10 3
4.0 2.0 2 5 7 10
3.0 3.0 3 5 3 4
```

4 Output Format

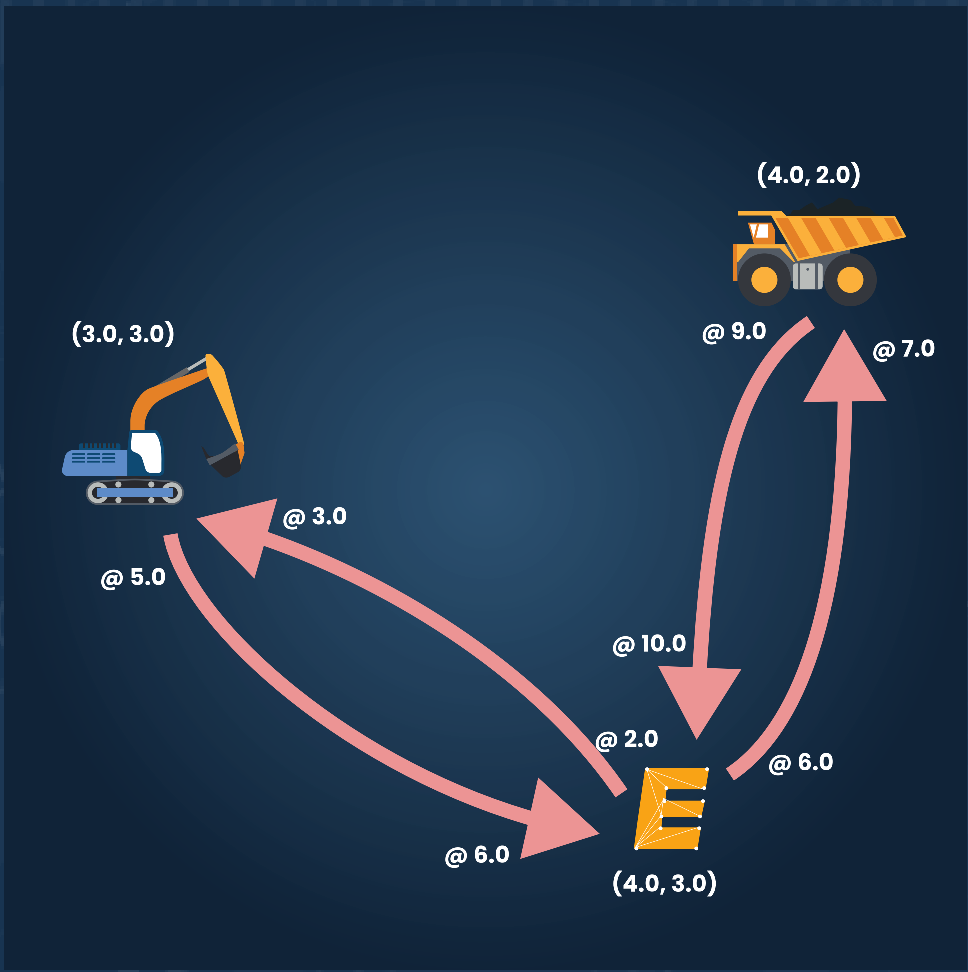
You should output $2 \cdot \left| \bigcup_{s \in S} A_s \right|$ lines. (i.e., 2 lines for each agent). The first $2 \cdot |A_1|$ lines corresponds to the 1^{st} site's agents, and the next $2 \cdot |A_2|$ lines for the 2^{nd} site's agents, etc.

For each agent, the 1^{st} line contains a single decimal representing the time of leaving the site (starting the trip). The 2^{nd} line contains the IDs of the requests to be handled, in order and space separated. The ID of the request is the order of request in the input (starting at 1).

If the agent didn't need to serve any requests, you should print two lines containing -1.

Sample Output:

```
6.0
1
-1
-1
2.0
2
```



5 Scoring

The problem comprises **6** test cases with the travel time serving as the cost for each case. The lower the associated cost, the higher your rank.

The participant's score, which is used to determine their rank, is calculated as the reciprocal sum of the cost of the solved test cases:

$$Score = \sum_{t \in Solved} \frac{1}{Cost(t)}$$

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Problem Setters

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