Hit the road!

Introduction

The relative peace reigned in the Universum. The beetlejumpers bravely repelled the sudden invasion of bloodthirsty dragonflies and the *BitBullet* munition factory to this day receives congratulations from senior military officials. Besides the celebrations, there came the time of in-depth analyses and evaluations. Did everything go as it should have?

"*Deployment of munitions*: LOSSES" – the final report turned out to be merciless. The factory workers perfectly handled the packing of munitions into containers. Unfortunately, the delivery plan was faltering and its implementation brought losses...

Problem

Your task is to plan the delivery of munitions in case of the resumptions of hostilities. You should serve C clients scattered in a two-dimensional space – the position of the *i-th* client is given as a point (x_i, y_i). *BitBullet* munition factory located in a point (m_x, m_y) is the starting and the final point of each beetcar – a truck used for the distribution of goods. The beetlejumpers cautiously build their bases far from each other. The positions of *BitBullet* and the clients are thus always unique. All beetcars have the same capacity, equal to Q units of munitions and departure from the factory in $t_0 = 0$ time. The *BitBullet* clients are well-organized and require the same from their suppliers.

Each *i-th* client demands d_i units of munitions in its time window $[b_i, e_i]$. The beetcar that arrives to the client before the opening of the time window must wait until the b_i time – only then can the truck access the unloading platform. The installation of beetcar on the unloading platform is extremely challenging, this is why each client may be visited only once. If the goods are delivered within the time frame, then the unloading may start immediately. The unloading of munitions lasts s_i time and may be finished after closing the time window. The travel time between any pair of points (two clients or a client and the factory) is equal to the distance between these points in a taxicab metric (the sum of modules of coordinate differences).

Failing to respect the requirements of any of the clients (arrival later than in e_i) causes huge financial penalties and the loss of trust of the remaining clients. *BitBullet* cannot afford to let it happen. Additional operating costs of beetcars are very high, and beesoline (fuel for beetcars) is still going up.

Input data

Test data are given in `roads*.in` files.

The first line of each test contains two (separated with a single whitespace) natural numbers: C – denoting the number of clients, and Q – denoting the maximum capacity of each beetcar. The second line contains two (separated with a single whitespace) natural numbers m_x and m_y, being the position of *BitBullet* in the Cartesian coordinate system. Each *i-th* of the following C lines consists of seven natural numbers: $\mathrm{ID}_i, x_i, y_i, b_i, e_i, d_i, s_i$, denoting respectively the client ID, time frame, number of units of the goods it demands, and the unloading time.

$$0 < C, Q, \mathrm{ID} \leqslant 10^4$$
$$0 \leqslant m_x, m_y, x_i, y_i \leqslant 5 \cdot 10^4$$
$$0 \leqslant b_i, e_i, s_i \leqslant 10^5$$
$$0 < d_i \leqslant Q$$

Output data

The output data should contain in the first line the K value, denoting the number of routes (equivalently – the number of required beetcars), and the T value, being the total distance traveled in the submitted solution. Each of the following K lines describes one route. The route should be given as a sequence of identifiers of the successively visited clients.

Example

For the input data:

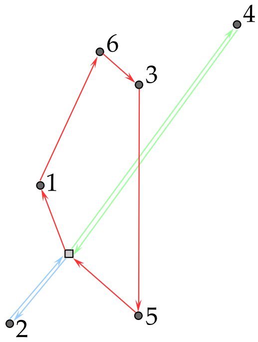
```
6 20
9 9
1 7 13 0 10 7 0
2 5 5 3 9 2 2
3 14 17 1 25 4 1
4 19 22 3 24 1 3
5 15 6 40 45 2 5
6 11 19 1 16 5 2
```

A possible answer is:

```
3 104
2
1 6 3 5
4
```

Explaining the example

The clients were served by 3 beetcars:



- Route 1: *BitBullet* $\to 2 \to$ *BitBullet*
  - $t = t_0 = 0$: departing from *BitBullet* to client 2
  - $t = 8$: reaching client 2, unloading
  - $t = 10$: departing from *BitBullet*
  - $t = 18$: reaching *BitBullet*
- Route 2: *BitBullet* $\to 1 \to 6 \to 3 \to 5 \to$ *BitBullet*
  - $t = t_0 = 0$: departing from *BitBullet* to client 1
  - $t = 6$: reaching client 1, unloading, departing to client 6
  - $t = 16$: reaching client 6, unloading

  - $t = 18$: departing to client 3
  - $t = 23$: reaching client 3, unloading
  - $t = 24$: departing to client 5
  - $t = 36$: reaching client 5
  - $t = 40$: unloading
  - $t = 45$: departing to *BitBullet*
  - $t = 54$: reaching *BitBullet*

- Route 3: *BitBullet* $\rightarrow 4 \rightarrow$ *BitBullet*
  - $t = t_0 = 0$: departing from *BitBullet* to client 4
  - $t = 23$: reaching client 4, unloading
  - $t = 26$: departing to *BitBullet*
  - $t = 49$: reaching *BitBullet*

$$
\begin{aligned}
T = {} & |9-5| + |9-5| + |5-9| + |5-9| + \\
& + |9-7| + |9-13| + |7-11| + |13-19| + |11-14| + \\
& + |19-17| + |14-15| + |17-6| + |15-9| + |6-9| + \\
& + |9-19| + |9-19| + |19-9| + |19-9| = 104 \\
S = {} & \frac{6}{3} + \frac{142}{104} = 3.365
\end{aligned}
$$

Score

If the following conditions are fulfilled:

- output data are correctly formatted,
- the number of the used beetcars (K) is less or equal than the number of clients (C),
- the capacity was not exceeded for any beetcar,
- the unloading of munitions at each client started within the corresponding time frame,
- each client was visited only once,
- the total travel distance (T) was correctly calculated,

then the score for a given set is equal to the value of $S = \frac{C}{K} + \frac{T_0}{T}$ (rounded to three decimal places), where T_0 is the total distance traveled in the solution where $K = C$. Otherwise the score is 0.