

Cities of Finland

Problem ID: citiesoffinland

You're a cartographer tasked with designing a new political map of Finland. In order to make your map easy to read, you've decided to group cities by their population. Larger cities will have larger fonts and smaller cities will have smaller fonts.

In order for this scheme to work, you need a metric to divide the cities into population ranges that reflect their relative size. You want your ranges to reflect how big cities are relative to one another, so similarly sized cities should be members of the same range. In order to get the best ranges possible, you want to minimize the total standard deviation over all of the ranges.

For a given range of cities $k = k_1, k_2, \dots, k_m$ (where k_i is the population of the i th city) the average population is

$$\bar{k} = \frac{\sum_{i=1}^m k_i}{m}.$$

The standard deviation for that range can be calculated as follows

$$\sqrt{\frac{\sum_{i=1}^m (k_i - \bar{k})^2}{m}}.$$



Input

The first line contains two space separated integers c and n ($1 \leq c \leq 100$ and $c \leq n \leq 500$) where c is the number of ranges to divide the n cities. The following n lines contain city descriptions with a city name and population. All city names are unique. All populations are in the range $1 \leq p \leq 10^6$

In the sample input, we want to divide 8 towns into three ranges. The best way to do this groups the four small towns (Lappeenranta, Rovaniemi, Pori, and Joensuu) and the three medium sized towns (Tampere, Turku, and Oulu) leaving Helsinki in a range by itself.

Output

Print, in ascending order, the population ranges with the minimum total standard deviation (there should be c lines of output). There will be one unique solution. The first range starts at 0 and goes to the maximum population in that range. Every other range starts one past the last range's maximum.

Sample Input 1

```
3 8
Helsinki 620000
Tampere 220000
Lappeenranta 59000
Turku 180000
Oulu 200000
Rovaniemi 58000
Pori 76000
Joensuu 58000
```

Sample Output 1

```
0-76000
76001-220000
220001-620000
```