UVa Online Judge

10034 Freckles

In an episode of the Dick Van Dyke show, little Richie connects the freckles on his Dad's back to form a picture of the Liberty Bell. Alas, one of the freckles turns out to be a scar, so his Ripley's engagement falls through.

Consider Dick's back to be a plane with freckles at various (x, y) locations. Your job is to tell Richie how to connect the dots so as to minimize the amount of ink used. Richie connects the dots by drawing straight lines between pairs, possibly lifting the pen between lines. When Richie is done there must be a sequence of connected lines from any freckle to any other freckle.

Input

The input begins with a single positive integer on a line by itself indicating the number of the cases following, each of them as described below. This line is followed by a blank line, and there is also a blank line between two consecutive inputs.

The first line contains $0 < n \leq 100$, the number of freckles on Dick's back. For each freckle, a line follows; each following line contains two real numbers indicating the (x, y) coordinates of the freckle.

Output

For each test case, the output must follow the description below. The outputs of two consecutive cases will be separated by a blank line.

Your program prints a single real number to two decimal places: the minimum total length of ink lines that can connect all the freckles.

Sample Input

```
1

3
1.0 1.0
2.0 2.0
2.0 4.0
```

Sample Output

```
3.41
```

Grid MST

This is a very simple problem. You are given N points. Some points may be repeated. The weight (distance) between two points is given by the Manhattan between the two points. Find the weight of a Minimum Spanning Tree that spans these N points.

Input

The input consists of:

- One line with one integer N ($1 \leq N \leq 100\,000$), the number of points,
- N lines each with two integers x and y ($0 \leq x, y < 1\,000$), the coordinates of each point.

Output

Output one line with a single integer: The weight of a Minimum Spanning Tree that spans these N points.

Sample Input 1

```
4
0 0
0 1
1 0
1 1
```

Sample Output 1

```
3
```

Sample Input 2

```
5
0 0
10 0
10 0
11 1
12 2
```

Sample Output 2

```
14
```

D. ShortestPath Query

De Prezer loves $troyic$ paths.Consider we have a graph with n vertices and m edges.Edges are directed in one way.And there is at most one edge from any vertex to any other vertex.If there is an edge from v to u, then $c(v, u)$ is its color and $w(v, u)$ is its length.Otherwise,$c(v, u) = w(v, u) = -1$.

A sequence $p_1, p_2, ..., p_k$ is a troyic path is and only if for each $1 \le i \le k$, $1 \le p_i \le n$ and if $i < k$, then $c(p_i, p_{i+1}) > -1$ and if $i + 1 < k$, then $c(p_i, p_{i+1}) \neq c(p_{i+1}, p_{i+2})$.

The length of such troyic path is $\sum_{i=1}^{k-1} w(p_i, p_{i+1})$ and it's called a p_1 - p_k path.

In such graph, length of the shortest path from vertex v to u is the minimum length of all v - u paths.(The length of the shortest path from any vertex to itself equals 0)

De Prezer gives you a graph like above and a vertex s.

De Prezer also loves query. So he gives you q queries and in each query, gives you number t and you should print the length of the shortest path from s to t (or -1 if there is no troyic path from s to t)

Input

The first line of input contains three integers n and m and C, the number of vertices, the numbers of edges and the number of valid colors.

The next m lines, each line contains 4 integers $v, u, w(v, u), c(v, u)$ ($1 \le v, u \le n$ and $v \neq u$ and $1 \le w(v, u) \le 10^9$ and $1 \le c(v, u) \le C$).

The line after that contains integer s and q.

The next q lines, each line contains information of one query, number t.

$1 \le n, m, C, q \le 10^5$

$m \le n(n - 1)$

$1 \le s, t \le n$

Output

For each query, print the answer.

Examples

input
5 4 1000 1 2 10 1 2 3 10 2 3 4 10 2 4 5 10 1 1 5 1 2 3 4 5

output
0 10 20 -1 -1