

Electricity



Although you helped him a lot with the chess queen game, Ivancho couldn't make his crush love him because he acknowledged that she prefers boys with expensive sports cars and big muscles.

He was very disappointed and started travelling around the Far East. There he was searching for old monk who was supposed to show him the meaning of life. By far Ivancho hasn't found him but he has found a big region with a lot of villages with no electricity.

At this moment Ivancho remembered that he and his friend – the businessman Kircho, can start a business together by making electrical power plants at the region and selling electricity.

Ivancho was very happy about the fact that they can earn a lot of money. He started researching what they will actually need. He used difficult physics and math formulas and discovered that they have to build a power plant near each village. Then some of the power plants have to be connected with power lines so that they will be sure that if one power plant doesn't work everywhere will have electricity. Also he knows that it is not good to have any pairs of overhead power lines crossing because there are some technical issues that don't allow that. Also if a power line comes over a power plant, the power plant will not function properly. It is also impossible to have two power plants at the same place.

The calculations made by Ivancho showed him which power plants he has to connect. He proved that there can be a placement of the power plants where each connection exists and no two power lines cross. Then he had to place each power plant as close as he could to the village it works for.

At the moment when Ivancho was building its code his laptop ran out of battery and he couldn't charge it because there was no electricity in the region. Fortunately he managed to find a post office where he sent a letter to Kircho in which he described everything he has calculated. Kircho was very happy about his friend's idea and decided to make you help him. You have 3 weeks to make the program electricity which, by given the coordinates of each village and a list of numbers of power plants which have to be connected, places each power plant as close to the village it supplies and specifies to which village each power plant is connected. Meanwhile Ivancho will continue searching for the famous monk.

In the letter sent by Ivancho the positions of the N villages are described as points on the coordinate system. Also, Ivancho has described M pairs of numbers a_i и b_i – the numbers of power plants that have to be connected with wires.

It's possible to somehow place all power plants and make power lines between them but it is not guaranteed that you can place all power plants in their corresponding villages without two power lines crossing.

Actually, building all power plants in that order is very difficult. Fortunately, the two friends have found out that they can take electricity from a big power plant situated far from their region. The distance between the power plant and each village is considered to be 201516. In this case the power supply in that village is considered secure and the connections between the power plant that supplies this village and the others described in Ivancho's letter are unnecessary. Ivancho says that there is no need for additional power lines in the other parts of the network. The connection between the village and that power plant is made under the ground, so this connection cannot come in contact with the ones of Ivancho's power plants.

Each power line is defined as a segment from point a_i to b_i .

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Each power line connects only two power plants and “under“ it can’t be placed any other power plant, even if that power plant isn’t connected to other power plants.

It is possible to place a power plant at the same point as a village. Actually that’s what Ivancho and Kircho strive for.

It is possible that a power plant is connected to more than one other and we don’t count that as a crossing.

It’s allowed that some power line passes through a village, unless there is a power plant there.

Kircho has an infinite length of wire, so the length of each power line doesn’t bother him. The only thing that the two friends want is to have each power plant as close as it can to the village it supplies and, of course, to have no power line crossing.

The connection between the village and the big power plant (the one that isn’t placed by Ivancho) is considered to be underground and you don’t have to mind it.

Input

On the first line of the input file `electricity.in` are given the numbers N and M . The next N rows consist of two numbers – the coordinates of village i , after them there are M rows with two numbers each - the indices of power plants that the two friends want to connect.

Output

On the first row of the output file `electricity.out` you must print one integer K – the number of power plant that you have managed to place. On the next K rows you have to place 4 integers – the first one states the index of the power plant you have placed. The following two are its coordinates. After that you print the index of the village it supplies. Each power plant must be placed in the first quadrant and neither the x nor the y coordinates can exceed 10 000. ($0 \leq x, y \leq 10000$)

Constraints

$$0 \leq N \leq 100$$

$$0 \leq M \leq (3 \cdot N) - 6$$

$$0 \leq a_i, b_i \leq 10000 (10^4)$$

Note:

At least 30% from the test cases have an optimal solution (i.e. it is possible to place all power plants in villages).

In 10% of the test cases, the vertices corresponding to the power plants are not in one connected component.

Evaluation

In the task we want to minimize the distance between each power plant and the village it supplies. That’s why we find the sum of the distances between each power plant and its corresponding village. For each village that doesn’t have a power plant we add the distance 201516. This total value is defined as yourScore. The best score for that test case is defined as minScore. For each test case you will receive $\left(\frac{\text{minScore}+1}{\text{yourScore}+1}\right)^3$ percent of the points for the test case.

If your output doesn’t meet one or more of the requirements in the task you will receive 0 points.

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Distance between village and its power plant we will define as the absolute distance between the two points.

Example

Input (electricity.in)	Output (electricity.out)
8 9	8
9 8	1 10 0 2
10 0	2 8 0 6
14 4	3 14 4 3
10 4	4 10 4 4
9 12	5 8 4 8
8 0	6 4 4 7
4 4	7 9 12 5
8 4	8 9 8 1
1 2	
1 4	
2 4	
2 5	
3 4	
3 7	
4 5	
5 6	
6 7	

Notes:

You can use visualizer for the task here:

<http://codeit.bg/season5/Visualizer5-3.html>