

Problem J. Parade

Input file: *standard input*
Output file: *standard output*
Time limit: ?? seconds
Memory limit: 512 mebibytes

Byteland is a huge country with n cities numbered 1 to n . Byteland lies on a plane with Cartesian coordinate system, i -th city lies at (x_i, y_i) point. No two cities share the same coordinates.

Large number of cities is often associated with a powerful, well governed state, but not everyone is equally happy with that. Bytomear, newly elected chancellor, was designated an important task namely organizing Christmas Parade visiting all cities and returning to the starting city. However Bytomear has very poor public support, so if he fails to choose optimal order of cities (minimizing total length) the public will accuse him of wasting public money. On the other hand finding the optimal route (known as *travelling salesman problem*) is a *NP-hard problem* and requires an infeasible amount of computational power, so the King of Byteland when he was told how much it would cost to find the optimal solution decided to vastly reduce the size of the Parade.

It was decided that the Parade will visit k cities only. Bytomear is entitled to choose k cities however he wants (the public can just be told, that those cities were chosen because of their historic and cultural heritage), but from all $k!$ possible orders of visiting them he has to pick the shortest one.

Can you help him?

Formally: your task is that for given n points pick k of them and output them in some order. Let A denote the total length of your route. If Jury program finds an order of the same cities with length at most $A \cdot (1 - 10^{-9})$ your answer will be considered incorrect.

Total length of path P_1, P_2, \dots, P_k equals sum of k Euclidean distances

$$d(P_1, P_2) + d(P_2, P_3) + \dots + d(P_{k-1}, P_k) + d(P_k, P_1),$$

where *Euclidean distance* of points $P_a(x_a, y_a)$ i $P_b(x_b, y_b)$ equals:

$$d(P_a, P_b) = \sqrt{(x_a - x_b)^2 + (y_a - y_b)^2}$$

If some of cities are collinear and route between two of them passes through the third one then the Parade can just go around it using one of bridges, which are numerous in Byteland.

Input

First line contains two integers n and k ($n = 300\,000$, $k = 500$) – number of all cities in Byteland, and number of cities that the Parade is to visit. Note: sample testcase doesn't meet this constraint and **it is NOT in the testset on the online judge** (submitted solutions will not be run on it). i -th of the following n lines contains two integers x_i, y_i ($-10^8 \leq x_i, y_i \leq 10^8$) denoting coordinates of i -th city. For $i \neq j$ either $x_i \neq x_j$ or $y_i \neq y_j$ holds.

Output

Output k lines each containing two integers x_i, y_i separated by single space denoting coordinates of consecutive cities on the route. None of cities may appear more than once. Output any of possible solutions.

Example

standard input	standard output
6 4	-10 10
-10 -10	48 10
-10 10	50 10
10 -10	-10 -10
50 10	
10 10	
48 10	

Example explanation: Outputted $k = 4$ cities reach total distance of:

$$\sqrt{58^2 + 0^2} + \sqrt{2^2 + 0^2} + \sqrt{60^2 + 20^2} + \sqrt{0^2 + 20^2} \approx 143.246$$

No other order of visiting those cities reaches smaller distance, so this is one of valid outputs. We remind that the sample testcase is **not** in the testset on the online judge.