

[0 pts] Optimal Location for Warehouses

International Paper recently has been completed \mathbf{n} paper factories along the road between Ankara and Istanbul, and assume the location of each can be represented by x_i . The output capacity of factories are not identical, and, to be more specific, the i -th factory is able to daily produce v_i tons of paper.

The authority of the company has decided to build \mathbf{k} warehouses to collect the manufactured paper. The locations of warehouses will be chosen among the location of the factories. In other word, they have to choose \mathbf{k} points among \mathbf{n} possible locations to build the warehouse.

There are, however, some rules and constraints that make this task a little tricky, which are as follow:

- It is feasible to move product between any two pairs of factories.
- It is not permitted to partially move product from factories. In other words, if there is \mathbf{v} tones at a factory, you only can move the whole \mathbf{v} or nothing.
- The cost of moving \mathbf{v} tons of paper from factory located in x_i to factory located in x_j is equal to $|x_i - x_j| \times v$

You have been employed to help them find the optimal locations of the warehouses. Congratulations!

Input

The first line contains two integers \mathbf{n} and \mathbf{k} ($1 \leq k \leq n \leq 5000$) – where \mathbf{n} is the number of factories and \mathbf{k} is the number warehouses that are going to be built.

In the next \mathbf{n} lines, you are given two integers defining the location of a factory, and the output capacity of the factory. To be more precise, the i -th line contains x_i , the location of i -th factory, and v_i , the capacity of i -th factory.

$$1 \leq w_i, x_i \leq 10^6$$

Output

Print a single integer denoting the the total cost of consolidating the output of \mathbf{n} factories into \mathbf{k} warehouses.

Example 1

Input

3 1
20 1
30 1
40 1

Output

20

Explanation

Simply choose $x=30$ as the warehouse location

Example 2

Input

3 1
11 3
12 2
13 1

Output

4

Explanation

Simply choose $x=11$ as the warehouse location

Example 3

Input

6 2
10 15
12 17
16 18
18 13
30 10
32 1

Output

182

Explanation

we need to choose two locations:

1. Move the output from the from the factories at locations, $\mathbf{x}=10$, $\mathbf{x}=16$, and $\mathbf{x}=18$ to the warehouse at $\mathbf{x}=12$.
2. Move the product from the factory at location $\mathbf{x}=32$ to the warehouse at $\mathbf{x}=30$.

Deliveries

You are suppose to find efficient algorithm that can solve the question in reasonable complexity. You also need to make a document that clearly explain your approach, the correctness of it and your reasoning for asymptotic complexity. You also need to manually write 10 test cases (both input and output) to check correctness of your program. Your test cases should be such that it consider a variety of possibilities.