Mining

HackerRank

There are n gold mines along a river, and each mine i produces w_i tons of gold. In order to collect the mined gold, we want to redistribute and consolidate it amongst exactly k mines where it can be picked up by trucks. We do this according to the following rules:

- You can move gold between any pair of mines (i.e., i and j, where $1 \le i < j \le n$).
- All the gold at some pickup mine i must either stay at mine i or be completely moved to some other mine, j.
- Move w tons of gold between the mine at location x_i and the mine at location x_j at a cost of $|x_i - x_j| \times w$.

Given n, k, and the amount of gold produced at each mine, find and print the minimum cost of consolidating the gold into k pickup locations according to the above conditions.

Input Format

The first line contains two space-separated integers describing the respective values of n (the number of mines) and k (the number of pickup locations).
Each line i of the n subsequent lines contains two space-separated integers describing the respective values of x_i (the mine's distance from the mouth of the river) and w_i (the amount of gold produced in tons) for mine i.

Note: It is guaranteed that the mines are will be given in order of ascending location.

Constraints

- $1 \le k < n \le 5000$
- $1 \le w_i, x_i \le 10^6$

Output Format

Print a single line with the minimum cost of consolidating the mined gold amongst k different pickup sites according to the rules stated above.

Sample Input 0

```
3 1
20 1
30 1
40 1
```

Sample Output 0

```
20
```

Explanation 0

We need to consolidate the gold from $n = 3$ mines into a single pickup location (because $k = 1$). The mines are all equidistant and they all produce the same amount of gold, so we just move the gold from the mines at locations $x = 20$ and $x = 40$ to the mine at $x = 30$ for a minimal cost of 20.

Sample Input 1

```
3 1
11 3
12 2
13 1
```

Sample Input 1

```
4
```

Explanation 1

We need to consolidate the gold from $n = 3$ mines into a single pickup location (because $k = 1$). We can achieve a minimum cost of 4 by moving the gold from mines $x = 12$ and $x = 13$ to the mine at $x = 11$.

Sample Input 2

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

Sample Output 2

```
182
```

Explanation 2

We need to consolidate the gold from $n = 6$ mines into $k = 2$ pickup locations. We can minimize the cost of doing this by doing the following:

1. Move the gold from the mines at locations $x = 10$, $x = 16$, and $x = 18$ to the mine at $x = 12$.
2. Move the gold from the mine at location $x = 32$ to the mine at $x = 30$.