ICPC SouthWestern Europe Practice Contest 2019–2020

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Judges and Problem Setters

- Mehdi Bouaziz (Nomadic Labs)
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- Thomas Deniau (Apple)
- Jean-Christophe Filliâtre (CNRS)
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- Raphaël Marinier (Google)
- Miguel Oliveira (Facebook)

This problem set consists of 4 problems, on 8 pages.

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B: Meditation

Time limit: 1 second

Luna had a stressful day and she wants to do a meditation routine that relaxes her well. Luna's routines are more or less relaxing and to determine how relaxing a routine is, Luna computes its score: the higher the score, the more relaxing it is!

Luna has graded each of the n exercises with a positive integer and the score of a routine is simply the sum of the grades of its individual exercises. She gives you her list of graded exercises and asks you what is the maximal grade of a routine composed of k different exercises.

Input

The first line of the input contains two space-separated integers: n and k. The n following lines each contain a single integer, the $i+1$-th line containing the grade g_i of the i-th exercise.

Output

The output should contain a single line with a single integer: the maximal score of a routine composed of k different exercises.

Limits

- $1 \leqslant k \leqslant n \leqslant 100\,000$
- for all $1 \leqslant i \leqslant n$, we have $0 \leqslant g_i \leqslant 10\,000$

Sample Input

```
5 3
10
22
7
3
10
```

Sample Output

```
42
```

Sample Explanation

We select the exercises 1, 2 and 5 which gives a total score of $10 + 22 + 10 = 42$.

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C: Rounds

Time limit: 1 second

The popular PerfectShape online group gathers fans of workouts and healthy lifestyle all over the world. Every group member has managed to gain a certain amount of credits for the trendy M0V3 online sports platform, giving them access to various workout and relaxation resources.

The amount of credits owned may however largely differ from one person to the other. Since PerfectShape members value sharing and solidarity, they decide to redispatch credits by playing the following game:

The N group members are numbered from 1 to N and the game comprises k rounds, for some integer k such that $1 \leqslant k \leqslant N$. During the i-th round of the game, all members except member i give S credits to member i. The game may end after any round, and its outcome will be the minimum amount of credits held by a member of the group after that round.

Your task is to figure out the maximum possible game outcome, across all possible game endings.

Input

The first line of the input contains two integers N and S. Each of the N following lines contains a single integer, the $(i+1)$-th line containing the amount of credits C_i initially owned by member i.

Output

The output should contain a single integer value C corresponding to the maximum possible game outcome.

Limits

- $1 \leqslant N \leqslant 100\,000$
- $1 \leqslant S \leqslant 100\,000\,000$
- for all i, $1 \leqslant C_i \leqslant 100\,000\,000$ and $S \times (N-1) \leqslant C_i$.

Sample Input

```
3 10
24
42
38
```

Sample Output

```
28
```

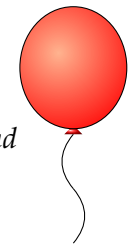
Sample Explanation

The game proceeds as follows:

- After round 1 the amounts of credits held are 44, 32, 28 and the minimum is 28.
- After round 2 the amounts of credits held are 34, 52, 18 and the minimum is 18.
- After round 3 the amounts of credits held are 24, 42, 38 and the minimum is 24.

The best possible outcome is therefore 28, which corresponds to ending the game after round 1.

D: Statues



Time limit: 1 second

To escape the loneliness of working remotely everyday, Erika decided to try on a new hobby: sculpture. She already has a large collection of statues and the municipality has allowed her to show her art outside.

Erika wants her statues to be well visible and thus each statue needs to be placed under a distinct street light. Further, the arrangement should be aesthetic which means that the statues should be placed by increasing size with the smallest statues near the beginning of the street and the biggest ones near the end.

Erika placed her statues but she forgot to place them in increasing size and now she has to reposition them in accordance to both of her desires.

The street has N evenly spaced street lights numbered from 1 at the beginning of the street to N at the end of the street. You estimate the time required to move a statue of size s from the street light i to the light j as taking Erika $s \times |i - j|$ units of time. You ask yourself, how much time does it take to reposition all statues knowing that she will use the fastest way possible? Note that she may put statues under street lights that do not have statues at the moment.

Input

The first line of the input contains two space-separated integers: N the number of street lights and K the number of statues. The K following lines each contains two space-separated integers, the $i + 1$-th line containing the integers P_i and S_i describing the i-th statue. P_i gives the number of the street light under which the statue is and S_i gives its size.

Output

The output should contain a single line containing a single integer: the minimum amount of time needed to move statues such that each statue is under a different street light and such that the size of statues grows with the street light numbers under which they are.

Limits

- $1 \leqslant K \leqslant N \leqslant 5\,000$
- for all $1 \leqslant i \leqslant K$, $1 \leqslant S_i \leqslant 1\,000\,000$, $1 \leqslant P_i \leqslant N$

Sample Input 1

```
3 3
1 3
2 2
3 1
```

Sample Output 1

```
8
```

Sample Explanation 1

Because there are as many street lights as there are statues we need to position the statue of size 1 at street light 1 (which takes $1 \times |3 - 1 = 2|$ units of times), leave the statue of size 2 at street light 2, and move the statue of size 3 to the street light 3 (which takes $3 \times |1 - 3| = 6$ units of times). In total this takes 8 units of time.

Sample Input 2

```
4 3
2 2
3 2
4 1
```

Sample Output 2

```
3
```

Sample Explanation 2

The fastest way of fixing the ordering of statues is to move the statue of size 1 to the street light 1 for a total time of $1 \times |4 - 1| = 3$.