A. Megacity

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

The administration of the Tomsk Region firmly believes that it's time to become a megacity (that is, get population of one million). Instead of improving the demographic situation, they decided to achieve its goal by expanding the boundaries of the city.

The city of Tomsk can be represented as point on the plane with coordinates $(0; 0)$. The city is surrounded with n other locations, the i-th one has coordinates (x_i, y_i) with the population of k_i people. You can widen the city boundaries to a circle of radius r. In such case all locations inside the circle and on its border are included into the city.

Your goal is to write a program that will determine the minimum radius r, to which is necessary to expand the boundaries of Tomsk, so that it becomes a megacity.

Input

The first line of the input contains two integers n and s $(1 \le n \le 10^3; 1 \le s < 10^6)$ — the number of locatons around Tomsk city and the population of the city. Then n lines follow. The i-th line contains three integers — the x_i and y_i coordinate values of the i-th location and the number k_i of people in it $(1 \le k_i < 10^6)$. Each coordinate is an integer and doesn't exceed 10^4 in its absolute value.

It is guaranteed that no two locations are at the same point and no location is at point $(0; 0)$.

Output

In the output, print "-1" (without the quotes), if Tomsk won't be able to become a megacity. Otherwise, in the first line print a single real number — the minimum radius of the circle that the city needs to expand to in order to become a megacity.

The answer is considered correct if the absolute or relative error don't exceed 10^{-6}.

Examples

input

```
4 999998
1 1 1
2 2 1
3 3 1
2 -2 1
```

output

```
2.8284271
```

input

```
4 999998
1 1 2
2 2 1
3 3 1
2 -2 1
```

output

```
1.4142136
```

input

```
2 1
1 1 999997
2 2 1
```

output

```
-1
```

B. Vanya and Lanterns

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vanya walks late at night along a straight street of length l, lit by n lanterns. Consider the coordinate system with the beginning of the street corresponding to the point 0, and its end corresponding to the point l. Then the i-th lantern is at the point a_i. The lantern lights all points of the street that are at the distance of at most d from it, where d is some positive number, common for all lanterns.

Vanya wonders: what is the minimum light radius d should the lanterns have to light the whole street?

Input

The first line contains two integers n, l ($1 \leq n \leq 1000$, $1 \leq l \leq 10^9$) — the number of lanterns and the length of the street respectively.

The next line contains n integers a_i ($0 \leq a_i \leq l$). Multiple lanterns can be located at the same point. The lanterns may be located at the ends of the street.

Output

Print the minimum light radius d, needed to light the whole street. The answer will be considered correct if its absolute or relative error doesn't exceed 10^{-9}.

Examples

input

```
7 15
15 5 3 7 9 14 0
```

output

```
2.5000000000
```

input

```
2 5
2 5
```

output

```
2.0000000000
```

Note

Consider the second sample. At $d = 2$ the first lantern will light the segment $[0, 4]$ of the street, and the second lantern will light segment $[3, 5]$. Thus, the whole street will be lit.

C. Kefa and Company

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Kefa wants to celebrate his first big salary by going to restaurant. However, he needs company.

Kefa has n friends, each friend will agree to go to the restaurant if Kefa asks. Each friend is characterized by the amount of money he has and the friendship factor in respect to Kefa. The parrot doesn't want any friend to feel poor compared to somebody else in the company (Kefa doesn't count). A friend feels poor if in the company there is someone who has at least d units of money more than he does. Also, Kefa wants the total friendship factor of the members of the company to be maximum. Help him invite an optimal company!

Input

The first line of the input contains two space-separated integers, n and d ($1 \le n \le 10^5$, $1 \le d \le 10^9$) — the number of Kefa's friends and the minimum difference between the amount of money in order to feel poor, respectively.

Next n lines contain the descriptions of Kefa's friends, the $(i+1)$-th line contains the description of the i-th friend of type m_i, s_i ($0 \le m_i, s_i \le 10^9$) — the amount of money and the friendship factor, respectively.

Output

Print the maximum total friendship factir that can be reached.

Examples

input

```
4 5
75 5
0 100
150 20
75 1
```

output

```
100
```

input

```
5 100
0 7
11 32
99 10
46 8
87 54
```

output

```
111
```

Note

In the first sample test the most profitable strategy is to form a company from only the second friend. At all other variants the total degree of friendship will be worse.

In the second sample test we can take all the friends.

D. CIA Datacenter

time limit per test: 2.0 s
memory limit per test: 256 MB
input: standard input
output: standard output

The CIA has decided to keep up with technology advancements and try to capture all the information passing in the internet. In order to store that information, they need to build a new datacenter. Since the information on the internet cables is captured with a very high speed, the datacenter needs to be built with a very high write speed capability. The information on this stage is only collected for future processing and will be deleted in a small period of time, therefore the reliability of storage is not in question, only the total speed of writing information to disks is important.

In order to fit in a tight budget set by the Congress last year, agency has decided to use cheap commercial-grade disks and controllers. The datacenter storage architecture is simple: disks are connected to controllers (there is no limit how many disks can be connected to a single controller) that are in turn connected to the central information intake. Every disk and controller can operate in parallel with others thus writing the data simultaneously. However, there are limits on the maximum writing speed for disks and on the maximum speed with which the controller can process incoming data.

The total write speed of the disks connected to one controller is the minimum between the sum of all disks' write speed limits and the speed limit of the controller.

Given the projected speed of information capture, please help CIA technical personnel to minimize the money spent on disks and controllers. The structure of market prices is such that you can assume it is crucial to minimize the number of disks first and then to minimize the number of controllers (without changing the number of disks).

Input

The first line of input contains integers A, B and C: the write speed limit of the disk, the speed limit of the controller for processing incoming data and the expected information capture speed ($1 \le A, B, C \le 10^9$).

Output

The first line of output should contain two integers X and Y: the number of disks and controllers needed to be able to save all incoming data according to the problem statement.

Examples

input
2 10 100
output
50 10

input
10 2 100
output
50 50

input
20 35 140
output
7 7

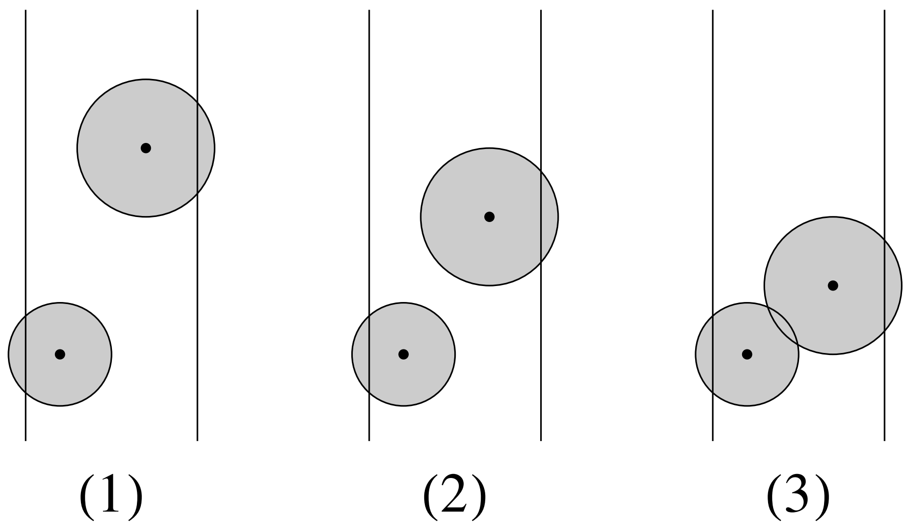
input
20 35 141
output
8 5

E. Getting Through

A long and straight corridor is fitted with a number of sensors. Each sensor has a certain range within which it can detect objects or persons. If a part of an object is within the sensor's range, an alarm will go off. Otherwise, nothing will happen.

Ethan needs to traverse this corridor in order to do some spy stuff at the other end. The question is, can he pass through the corridor without being detected? Can he fit so easily that he can bring some equipment along, or does he have to wear some tight clothing? Or can he perhaps sent a robot through instead?

We model the corridor as being two-dimensional (we ignore the height), bounded by two straight lines. Each sensor is located inside the corridor or on a wall. Their scopes are well in between the two ends of the corridor. We model the person or robot going through as a circle. Given the layout, what is the maximum radius this circle can have so that it is possible to negotiate the corridor without being detected?



A visual representation of the samples.

Input

On the first line one positive number: the number of test cases, at most 100. After that per test case:

- one line with a single integer w ($1 \leq w \leq 100\,000$): the width of the corridor. The two walls are given by the lines $x = 0$ and $x = w$.
- one line with a single integer n ($0 \leq n \leq 1\,000$): the number of sensors in the corridor.
- n lines with three space-separated integers x, y and r ($0 \leq x \leq w$, $-100\,000 \leq y \leq 100\,000$ and $1 \leq r \leq 100\,000$): the location and the range of each sensor, respectively.

The two ends of the corridor are at $y = -\infty$ and $y = +\infty$, or in less technical terms, they are far beyond the scope of all the sensors.

Output

Per test case:

- one line with one floating point number: the radius of the largest circular object (or person) that could pass through the corridor without being detected, assuming the object can (be) move(d) with absolute precision. If nothing could possibly get through, the output should be zero. The number should be accurate up to 10^{-6} absolute precision.

Sample in- and output

Input	**Output**
3 10 2 2 0 3 7 12 4 10 2 2 0 3 7 8 4 10 2 2 0 3 7 4 4	1.5 1.216991 0

F. Random Task

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

One day, after a difficult lecture a diligent student Sasha saw a graffitied desk in the classroom. She came closer and read: "Find such positive integer n, that among numbers $n+1$, $n+2$, ..., $2 \cdot n$ there are exactly m numbers which binary representation contains exactly k digits one".

The girl got interested in the task and she asked you to help her solve it. Sasha knows that you are afraid of large numbers, so she guaranteed that there is an answer that doesn't exceed 10^{18}.

Input

The first line contains two space-separated integers, m and k ($0 \le m \le 10^{18}$; $1 \le k \le 64$).

Output

Print the required number n ($1 \le n \le 10^{18}$). If there are multiple answers, print any of them.

Examples

input

```
1 1
```

output

```
1
```

input

```
3 2
```

output

```
5
```

G. Sign on Fence

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Bizon the Champion has recently finished painting his wood fence. The fence consists of a sequence of n panels of 1 meter width and of arbitrary height. The i-th panel's height is h_i meters. The adjacent planks follow without a gap between them.

After Bizon painted the fence he decided to put a "for sale" sign on it. The sign will be drawn on a rectangular piece of paper and placed on the fence so that the sides of the sign are parallel to the fence panels and are also aligned with the edges of some panels. Bizon the Champion introduced the following constraints for the sign position:

1. The width of the sign should be exactly w meters.
2. The sign must fit into the segment of the fence from the l-th to the r-th panels, inclusive (also, it can't exceed the fence's bound in vertical direction).

The sign will be really pretty, So Bizon the Champion wants the sign's height to be as large as possible.

You are given the description of the fence and several queries for placing sign. For each query print the maximum possible height of the sign that can be placed on the corresponding segment of the fence with the given fixed width of the sign.

Input

The first line of the input contains integer n — the number of panels in the fence ($1 \le n \le 10^5$).

The second line contains n space-separated integers h_i, — the heights of the panels ($1 \le h_i \le 10^9$).

The third line contains an integer m — the number of the queries ($1 \le m \le 10^5$).

The next m lines contain the descriptions of the queries, each query is represented by three integers l, r and w ($1 \le l \le r \le n$, $1 \le w \le r - l + 1$) — the segment of the fence and the width of the sign respectively.

Output

For each query print the answer on a separate line — the maximum height of the sign that can be put in the corresponding segment of the fence with all the conditions being satisfied.

Examples

input

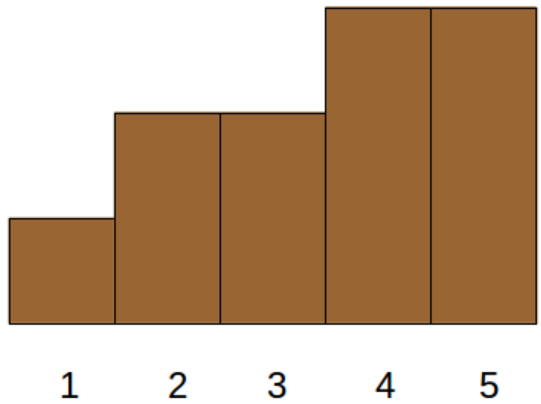
```
5
1 2 2 3 3
3
2 5 3
2 5 2
1 5 5
```

output

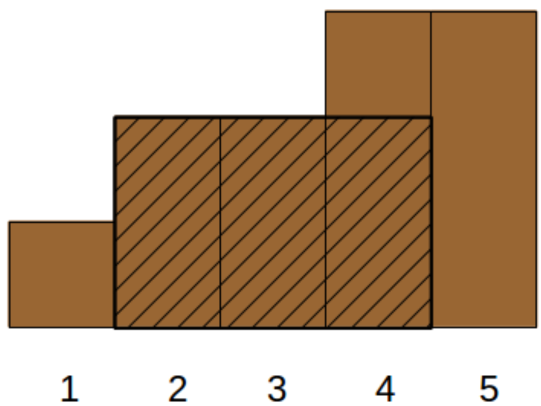
```
2
3
1
```

Note

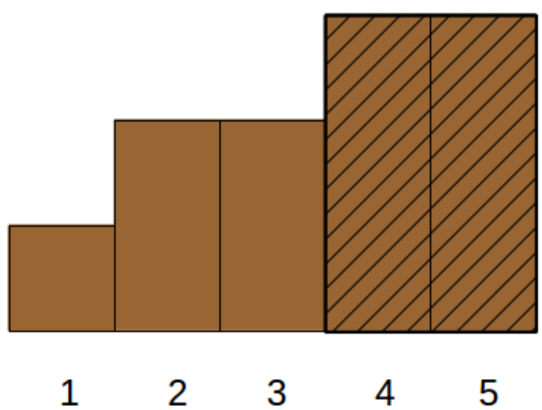
The fence described in the sample looks as follows:



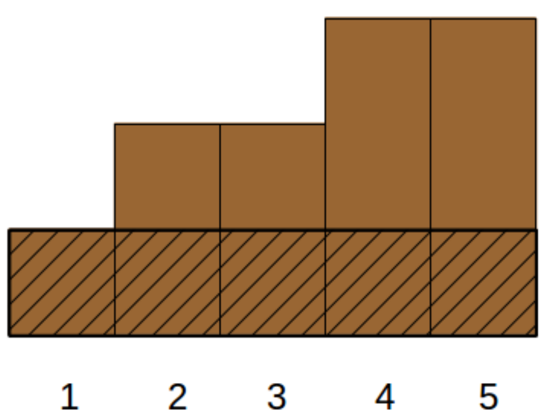
The possible positions for the signs for all queries are given below.



The optimal position of the sign for the first query.



The optimal position of the sign for the second query.



The optimal position of the sign for the third query.