A - September

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

There are 12 strings $S_1, S_2, \ldots, S_{12}$ consisting of lowercase English letters.

Find how many integers i $(1 \leq i \leq 12)$ satisfy that the length of S_i is i.

Constraints

- Each S_i is a string of length between 1 and 100, inclusive, consisting of lowercase English letters. $(1 \leq i \leq 12)$

Input

The input is given from Standard Input in the following format:

S_1
S_2
$\vdots$
S_{12}

Output

Print the number of integers i $(1 \leq i \leq 12)$ such that the length of S_i is i.

Sample Input 1

```
january
february
march
april
may
june
july
august
september
october
november
december
```

Sample Output 1

```
1
```

There is only one integer i such that the length of S_i is i: 9. Thus, print 1.

Sample Input 2

```
ve
inrtfa
npccxva
djiq
lmbkktngaovl
mlfiv
fmbvcmuxuwggfq
qgmtwxmb
jii
ts
bfxrvs
eqvy
```

Sample Output 2

```
2
```

There are two integers i such that the length of S_i is i: 4 and 8. Thus, print 2.

B - 1D Keyboard

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 200 points

Problem Statement

There is a keyboard with 26 keys arranged on a number line.

The arrangement of this keyboard is represented by a string S, which is a permutation of ABCDEFGHIJKLMNOPQRSTUVWXYZ. The key corresponding to the character located at coordinate x $(1 \leq x \leq 26)$. Here, S_x denotes the x-th character of S.

You will use this keyboard to input ABCDEFGHIJKLMNOPQRSTUVWXYZ in this order, typing each letter exactly once with your right index finger. To input a character, yo to move your finger to the coordinate of the key corresponding to that character and press the key.

Initially, your finger is at the coordinate of the key corresponding to A. Find the minimal possible total traveled distance of your finger from pressing the key for A to pressing the key for Z. Here, pressing a key does not contribute to the distance.

Constraints

- S is a permutation of ABCDEFGHIJKLMNOPQRSTUVWXYZ.

Input

The input is given from Standard Input in the following format:

S

Output

Print the answer.

Sample Input 1

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

Sample Output 1

```
25
```

From pressing the key for A to pressing the key for Z, you need to move your finger 1 unit at a time in the positive direction, resulting in a total traveled distance of 25. It is impossible to press all keys with a total traveled distance less than 25, so print 25.

Sample Input 2

```
MGJYIZDKSBHPVENFLQURTCWOAX
```

Sample Output 2

```
223
```

C - Max Ai+Bj

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 250 points

Problem Statement

You are given two integer sequences A and B, each of length N. Choose integers i, j $(1 \leq i, j \leq N)$ to maximize the value of $A_i + B_j$.

Constraints

- $1 \leq N \leq 5 \times 10^5$
- $|A_i| \leq 10^9$ $(i = 1, 2, \ldots, N)$
- $|B_j| \leq 10^9$ $(j = 1, 2, \ldots, N)$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{llll}
N & & & \\
A_1 & A_2 & \ldots & A_N \\
B_1 & B_2 & \ldots & B_N
\end{array}
$$

Output

Print the maximum possible value of $A_i + B_j$.

Sample Input 1

```
2
-1 5
3 -7
```

Sample Output 1

```
8
```

For $(i, j) = (1, 1), (1, 2), (2, 1), (2, 2)$, the values of $A_i + B_j$ are $2, -8, 8, -2$ respectively, and $(i, j) = (2, 1)$ achieves the maximum value 8.

Sample Input 2

```
6
15 12 3 -13 -1 -19
7 17 -13 -10 18 4
```

Sample Output 2

```
33
```

D - Hidden Weights

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

You are given a directed graph with N vertices and M edges. The j-th directed edge goes from vertex u_j to vertex v_j and has a weight of w_j.

Find one way to write an integer between -10^{18} and 10^{18}, inclusive, to each vertex such that the following condition is satisfied.

- Let x_i be the value written on vertex i. For all edges $j = 1, 2, \ldots, M$, it holds that $x_{v_j} - x_{u_j} = w_j$.

It is guaranteed that at least one such assignment exists for the given input.

Constraints

- $2 \leq N \leq 2 \times 10^5$
- $1 \leq M \leq \min\{2 \times 10^5, N(N-1)/2\}$
- $1 \leq u_j, v_j \leq N$
- $u_j \neq v_j$
- If $i \neq j$, then $(u_i, v_i) \neq (u_j, v_j)$ and $(u_i, v_i) \neq (v_j, u_j)$
- $|w_j| \leq 10^9$
- All input values are integers.
- There exists at least one assignment satisfying the conditions.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{lll}
N & M & \\
u_1 & v_1 & w_1 \\
u_2 & v_2 & w_2 \\
\vdots & & \\
u_M & v_M & w_M
\end{array}
$$

Output

Let x_i be the integer written on vertex i. Print $x_1, x_2, \ldots, x_N$ in this order, separated by spaces, on a single line. If there are multiple solutions, you may print any them.

Sample Input 1

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

Sample Output 1

```
3 5 2
```

By setting $x = (3, 5, 2)$, we have $x_2 - x_1 = w_1 = 2, x_2 - x_3 = w_2 = 3, x_3 - x_1 = w_3 = -1$, satisfying the conditions.

For example, $x = (-1, 1, -2)$ is also a valid answer.

Sample Input 2

```
4 2
2 1 5
3 4 -3
```

Sample Output 2

```
5 0 6 3
```

For example, $x = (0, -5, 4, 1)$ and $x = (5, 0, 4, 1)$ are also valid answers.

Sample Input 3

```
5 7
2 1 18169343
3 1 307110901
4 1 130955934
2 3 -288941558
2 5 96267410
5 3 -385208968
4 3 -176154967
```

Sample Output 3

```
200401298 182231955 -106709603 69445364 278499365
```

E - How to Win the Election

Time Limit: 2.5 sec / Memory Limit: 1024 MB

Score : 500 points

Problem Statement

An election is being held with N candidates numbered $1, 2, \ldots, N$. There are K votes, some of which have been counted so far.

Up until now, candidate i has received A_i votes.

After all ballots are counted, candidate i $(1 \leq i \leq N)$ will be elected if and only if the number of candidates who have received more votes than them is less thar There may be multiple candidates elected.

For each candidate, find the minimum number of additional votes they need from the remaining ballots to guarantee their victory regardless of how the other can receive votes.

Formally, solve the following problem for each $i = 1, 2, \ldots, N$.

Determine if there is a non-negative integer X not exceeding $K - \sum_{i=1}^{N} A_i$ satisfying the following condition. If it exists, find the minimum possible such integer.

- If candidate i receives X additional votes, then candidate i will always be elected.

Constraints

- $1 \leq M \leq N \leq 2 \times 10^5$
- $1 \leq K \leq 10^{12}$
- $0 \leq A_i \leq 10^{12}$
- $\sum_{i=1}^{N} A_i \leq K$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N M K
A_1 A_2 $\ldots$ A_N

Output

Let C_i be the minimum number of additional votes candidate i needs from the remaining ballots to guarantee their victory regardless of how other candidates rec votes. Print $C_1, C_2, \ldots, C_N$ separated by spaces.

If candidate i has already secured their victory, then let $C_i = 0$. If candidate i cannot secure their victory under any circumstances, then let $C_i = -1$.

Sample Input 1

```
5 2 16
3 1 4 1 5
```

Sample Output 1

```
2 -1 1 -1 0
```

14 votes have been counted so far, and 2 votes are left.
The C to output is $(2, -1, 1, -1, 0)$. For example:

- Candidate 1 can secure their victory by obtaining 2 more votes, while not by obtaining 1 more vote. Thus, $C_1 = 2$.
- Candidate 2 can never (even if they obtain 2 more votes) secure their victory, so $C_2 = -1$.

Sample Input 2

```
12 1 570
81 62 17 5 5 86 15 7 79 26 6 28
```

Sample Output 2

```
79 89 111 117 117 74 112 116 80 107 117 106
```

F - Knapsack with Diminishing Values

Time Limit: 3 sec / Memory Limit: 1024 MB

Score : 550 points

Problem Statement

There are N types of items. The i-th type of item has a weight of w_i and a value of v_i. Each type has 10^{10} items available.

Takahashi is going to choose some items and put them into a bag with capacity W. He wants to maximize the value of the selected items while avoiding choosing t many items of the same type. Hence, he defines the **happiness** of choosing k_i items of type i as $k_i v_i - k_i^2$. He wants to choose items to maximize the total happine all types while keeping the total weight at most W. Calculate the maximum total happiness he can achieve.

Constraints

- $1 \leq N \leq 3000$
- $1 \leq W \leq 3000$
- $1 \leq w_i \leq W$
- $1 \leq v_i \leq 10^9$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{ll}
N & W \\
w_1 & v_1 \\
w_2 & v_2 \\
\vdots & \\
w_N & v_N
\end{array}
$$

Output

Print the answer.

Sample Input 1

```
2 10
3 4
3 2
```

Sample Output 1

```
5
```

By choosing 2 items of type 1 and 1 item of type 2, the total happiness can be 5, which is optimal.

Here, the happiness for type 1 is $2 \times 4 - 2^2 = 4$, and the happiness for type 2 is $1 \times 2 - 1^2 = 1$.

The total weight is 9, which is within the capacity 10.

Sample Input 2

```
3 6
1 4
2 3
2 7
```

Sample Output 2

```
14
```

Sample Input 3

```
1 10
1 7
```

Sample Output 3

```
12
```

G - No Cross Matching

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 600 points

Problem Statement

There are $2N$ points $P_1, P_2, \ldots, P_N, Q_1, Q_2, \ldots, Q_N$ on a two-dimensional plane. The coordinates of P_i are (A_i, B_i), and the coordinates of Q_i are $(C_i, D_i$
three different points lie on the same straight line.

Determine whether there exists a permutation $R = (R_1, R_2, \ldots, R_N)$ of $(1, 2, \ldots, N)$ that satisfies the following condition. If such an R exists, find one.

- For each integer i from 1 through N, let segment i be the line segment connecting P_i and Q_{R_i}. Then, segment i and segment j $(1 \leq i < j \leq N)$ never int

Constraints

- $1 \leq N \leq 300$
- $0 \leq A_i, B_i, C_i, D_i \leq 5000$ $(1 \leq i \leq N)$
- $(A_i, B_i) \neq (A_j, B_j)$ $(1 \leq i < j \leq N)$
- $(C_i, D_i) \neq (C_j, D_j)$ $(1 \leq i < j \leq N)$
- $(A_i, B_i) \neq (C_j, D_j)$ $(1 \leq i, j \leq N)$
- No three different points lie on the same straight line.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{aligned}
&N \\
&A_1 \quad B_1 \\
&A_2 \quad B_2 \\
&\vdots \\
&A_N \quad B_N \\
&C_1 \quad D_1 \\
&C_2 \quad D_2 \\
&\vdots \\
&C_N \quad D_N
\end{aligned}
$$

Output

If there is no R satisfying the condition, print –1.

If such an R exists, print $R_1, R_2, \ldots, R_N$ separated by spaces. If there are multiple solutions, you may print any of them.

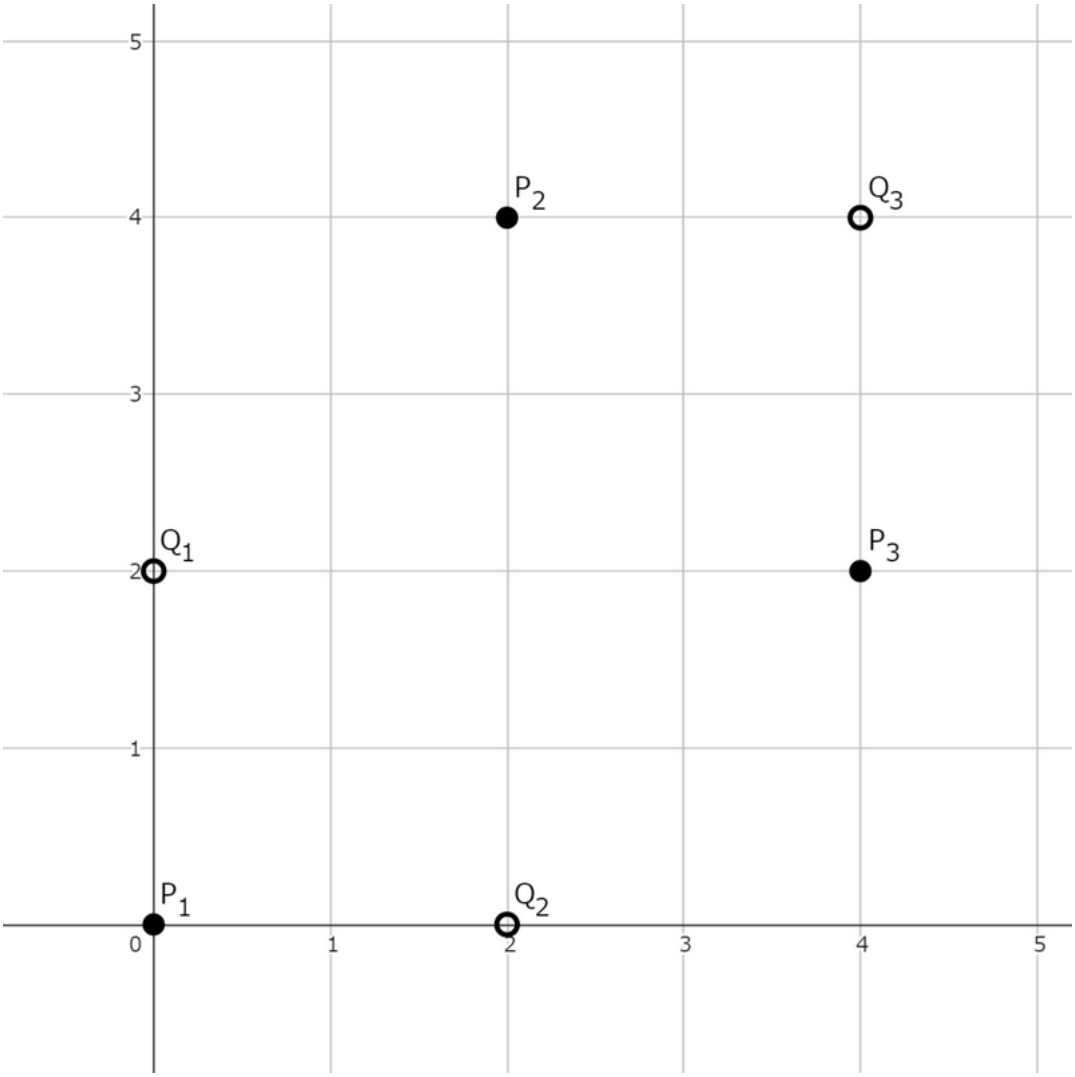
Sample Input 1

```
3
0 0
2 4
4 2
0 2
2 0
4 4
```

Sample Output 1

```
2 1 3
```

The points are arranged as shown in the following figure.



By setting $R = (2, 1, 3)$, the three line segments do not cross each other. Also, any of $R = (1, 2, 3)$, $(1, 3, 2)$, $(2, 3, 1)$, and $(3, 1, 2)$ is a valid answer.

Sample Input 2

```
8
59 85
60 57
72 12
3 27
16 58
41 94
77 64
97 20
32 37
7 2
57 94
35 70
38 60
97 100
5 76
38 8
```

Sample Output 2

```
3 5 8 2 7 4 6 1
```