A. Segment Tree for the Sum

time limit per test: 1 second
memory limit per test: 1024 megabytes

In this task, you need to write a regular segment tree for the sum.

Input

The first line contains two integers n and m ($1 \le n, m \le 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($0 \le a_i \le 10^9$). The following lines contain the description of the operations. The description of each operation is as follows:

- 1 i v: set the element with index i to v ($0 \le i < n$, $0 \le v \le 10^9$).
- 2 l r: calculate the sum of elements with indices from l to $r - 1$ ($0 \le l < r \le n$).

Output

For each operation of the second type print the corresponding sum.

Example

input Copy

```
5 5
5 4 2 3 5
2 0 3
1 1 1
2 0 3
1 3 1
2 0 5
```

output Copy

```
11
8
14
```

B. Segment Tree for the Minimum

time limit per test: 1 second
memory limit per test: 1024 megabytes

Now change the code of the segment tree so that the minimum on the segment is calculated instead of the sum.

Input

The first line contains two integers n and m ($1 \le n, m \le 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($0 \le a_i \le 10^9$). The following lines contain the description of the operations. The description of each operation is as follows:

- $1\ i\ v$: set the element with index i to v ($0 \le i < n$, $0 \le v \le 10^9$).
- $2\ l\ r$: calculate the minimum of elements with indices from l to $r - 1$ ($0 \le l < r \le n$).

Output

For each operation of the second type print the corresponding minimum.

Example

input Copy

```
5 5
5 4 2 3 5
2 0 3
1 2 6
2 0 3
1 3 1
2 0 5
```

output Copy

```
2
4
1
```

C. Number of Minimums on a Segment

time limit per test: 1 second
memory limit per test: 1024 megabytes

Now change the code of the segment tree so that, in addition to the minimum on a segment, it also counts the number of elements equal to the minimum.

Input

The first line contains two integers n and m ($1 \le n, m \le 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($0 \le a_i \le 10^9$). The following lines contain the description of the operations. The description of each operation is as follows:

- 1 i v: set the element with index i to v ($0 \le i < n$, $0 \le v \le 10^9$).
- 2 l r: calculate the minimum and number of elements equal to minimum of elements with indices from l to $r - 1$ ($0 \le l < r \le n$).

Output

For each operation of the second type print two integers: the minimum on a segment, and the number of elements equal to minimum.

Example

input Copy

```
5 5
3 4 3 5 2
2 0 3
1 1 2
2 0 3
1 0 2
2 0 5
```

output Copy

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

A. Segment with the Maximum Sum

time limit per test: 1 second
memory limit per test: 1024 megabytes

In this problem, you need to write a segment tree to find the segment with the maximum sum.

Input

The first line contains two numbers n and m ($1 \le n, m \le 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($-10^9 \le a_i \le 10^9$). The following lines contain the description of the operations. The description of each operation is as follows: i v, assign the value v to the element with index i ($0 \le i < n$, $-10^9 \le v \le 10^9$).

Output

Print $m + 1$ lines: the maximum sum of numbers on a segment before all operations and after each operation. Please note that this segment may be empty (so the sum on it will be equal to 0).

Examples

input Copy

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

output Copy

```
8
11
7
```

input Copy

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

output Copy

```
0
3
3
```

B. K-th one

time limit per test: 1 second
memory limit per test: 1024 megabytes

In this problem, you need to add to the segment tree the operation of finding the k-th one.

Input

The first line contains two numbers n and m ($1 \le n, m \le 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($a_i \in \{0, 1\}$). The following lines contain the description of the operations. The description of each operation is as follows:

- 1 i: change the element with index i to the opposite.
- 2 k: find the k-th one (ones are numbered from 0, it is guaranteed that there are enough ones in the array).

Output

For each operation of the second type, print the index of the corresponding one (all indices in this problem are from 0).

Example

input Copy

```
5 7
1 1 0 1 0
2 0
2 1
2 2
1 2
2 3
1 0
2 0
```

output Copy

```
0
1
3
3
1
```

C. First element at least X

time limit per test: 1 second
memory limit per test: 1024 megabytes

In this task, you need to add to the segment tree the operation of finding the minimum index j such that $a[j] \geq x$.

Input

The first line contains two integers n and m ($1 \leq n, m \leq 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($0 \leq a_i \leq 10^9$). The following lines contain the description of the operations. The description of each operation is as follows:

- 1 i v: change the item with index i to v ($0 \leq i < n$, $0 \leq v \leq 10^9$).
- 2 x: find the minimum index j such that $a[j] \geq x$. If there is no such element, print -1. Indices start from 0.

Output

For each operation of the second type, print the answer for the query.

Example

input Copy

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

output Copy

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

D. First element at least X - 2

time limit per test: 1 second

memory limit per test: 1024 megabytes

In this task, you need to add to the segment tree the operation of finding for the given x and l the minimum index j such that $j \geq l$ and $a[j] \geq x$.

Input

The first line contains two integers n and m ($1 \leq n, m \leq 100000$), the size of the array and the number of operations. The next line contains n numbers a_i, the initial state of the array ($0 \leq a_i \leq 10^9$). The following lines contain the description of the operations. The description of each operation is as follows:

- 1 i v: change the item with index i to v ($0 \leq i < n$, $0 \leq v \leq 10^9$).
- 2 x l: find the minimum index j such that $j \geq l$ and $a[j] \geq x$ ($0 \leq x \leq 10^9$, $0 \leq l < n$). If there is no such element, print -1. Indices start from 0.

Output

For each operation of the second type, print the answer for the query.

Example

input Copy

```
5 7
1 3 2 4 3
2 3 0
2 3 2
1 2 5
2 4 1
2 5 4
1 3 7
2 6 1
```

output Copy

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