You are given an undirected graph with N vertexes and M edges. Every vertex in this graph has an integer value assigned to it at the beginning. You're also given a sequence of operations and you need to process them as requested. Here's a list of the possible operations that you might encounter:

1. **Deletes an edge from the graph.**

   The format is [D X], where X is an integer from 1 to M, indicating the ID of the edge that you should delete. It is guaranteed that no edge will be deleted more than once.

2. **Queries the weight of the vertex with K-th maximum value among all vertexes currently connected with vertex X (including X itself).**

   The format is [Q X K], where X is an integer from 1 to N, indicating the id of the vertex, and you may assume that K will always fit into a 32-bit signed integer. In case K is illegal, the value for that query will be considered as undefined, and you should return 0 as the answer to that query.

3. **Changes the weight of a vertex.**

   The format is [C X V], where X is an integer from 1 to N, and V is an integer within the range $[-10^6, 10^6]$.

   The operations end with one single character, 'E', which indicates that the current case has ended. For simplicity, you only need to output one real number — the average answer of all queries.

Input

There are multiple test cases in the input file. Each case starts with two integers N and M ($1 \leq N \leq 2 * 10^4$, $0 \leq M \leq 6 * 10^4$), the number of vertexes in the graph. The next N lines describes the initial weight of each vertex ($-10^6 \leq weight[i] \leq 10^6$). The next part of each test case describes the edges in the graph at the beginning. Vertexes are numbered from 1 to N. The last part of each test case describes the operations to be performed on the graph. It is guaranteed that the number of query operations [Q X K] in each case will be in the range $[1, 2 * 10^5]$, and there will be no more than $2 * 10^5$ operations that change the values of the vertexes [C X V].

   There will be a blank line between two successive cases. A case with $N = 0$, $M = 0$ indicates the end of the input file and this case should not be processed by your program.

Output

For each test case, output one real number — the average answer of all queries, in the format as indicated in the sample output. Please note that the result is rounded to six decimal places.

Explanation for samples:
   For the first sample:
   D 3 – deletes the 3rd edge in the graph (the remaining edges are (1, 2) and (2, 3))
   Q 1 2 – finds the vertex with the second largest value among all vertexes connected with 1. The answer is 20.
   Q 2 1 – finds the vertex with the largest value among all vertexes connected with 2. The answer is 30.
   D 2 – deletes the 2nd edge in the graph (the only edge left after this operation is (1, 2))
   Q 3 2 – finds the vertex with the second largest value among all vertexes connected with 3. The answer is 0 (Undefined).
   C 1 50 – changes the value of vertex 1 to 50.
   Q 1 1 – finds the vertex with the largest value among all vertex connected with 1. The answer is 50.
   E – This is the end of the current test case. Four queries have been evaluated, and the answer to this case is $(20 + 30 + 0 + 50) / 4 = 25.000$.

   For the second sample, caution about the vertex with same weight:
   Q 1 1 – the answer is 20
   Q 1 2 – the answer is 20
   Q 1 3 – the answer is 10

Sample Input

```
3 3
10
20
30
1 2
2 3
1 3
D 3
Q 1 2
Q 2 1
D 2
Q 3 2
C 1 50
Q 1 1
E

3 3
10
20
20
1 2
2 3
1 3
Q 1 1
Q 1 2
Q 1 3
E
0 0
```

Sample Output

```
Case 1: 25.000000
Case 2: 16.666667
```