F - Contraction

Editorial (/contests/abc411/tasks/abc411_f/editorial)

Time Limit: 4 sec / Memory Limit: 1024 MiB

Score : 525 points

Problem Statement

You are given an undirected graph G_0 with N vertices and M edges. The vertices and edges of G_0 are numbered as vertices $1, 2, \ldots, N$ and edges $1, 2, \ldots, M$, respectively, and edge i $(1 \le i \le M)$ connects vertices U_i and V_i.

Takahashi has a graph G and N pieces numbered as pieces $1, 2, \ldots, N$.
Initially, $G = G_0$, and piece i $(1 \le i \le N)$ is placed on vertex i of G.

He will now perform Q operations in order. The i-th operation $(1 \le i \le Q)$ gives an integer X_i between 1 and M, inclusive, and performs the following operation:

> In G, if pieces U_{X_i} and V_{X_i} are placed on different vertices and there exists an edge e (on G) between them, create a graph G' by contracting that edge. In this case, if self-loops are created, remove them, and if multi-edges exist, replace them with simple edges.
> Then, all pieces that were placed on the two vertices connected by edge e in G are placed on the newly generated vertex by the contraction of e in G'. Pieces that were placed on other vertices in G are placed on the corresponding vertices in G'. Finally, set this resulting G' as the new G.
> If pieces U_{X_i} and V_{X_i} are placed on the same vertex, or if the vertices they are placed on are not connected by an edge, do nothing.

For each of the operations $i = 1, 2, \ldots, Q$, output the number of edges in G after the i-th operation.

▶ Edge Contraction

Constraints

- $2 \le N \le 3 \times 10^5$
- $1 \le M \le 3 \times 10^5$
- $1 \le U_i < V_i \le N$
- $(U_i, V_i) \ne (U_j, V_j)$ if $i \ne j$.
- $1 \le Q \le 3 \times 10^5$
- $1 \le X_i \le M$
- All input values are integers.

Input

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

$$
\begin{array}{l}
N \quad M \\
U_1 \quad V_1 \\
U_2 \quad V_2 \\
\vdots \\
U_M \quad V_M \\
Q \\
X_1 \quad X_2 \quad \ldots \quad X_Q
\end{array}
$$

Output

Output Q lines. On the i-th line $(1 \le i \le Q)$, output the number of edges in G after the i-th operation.

Sample Input 1 Copy

Copy

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

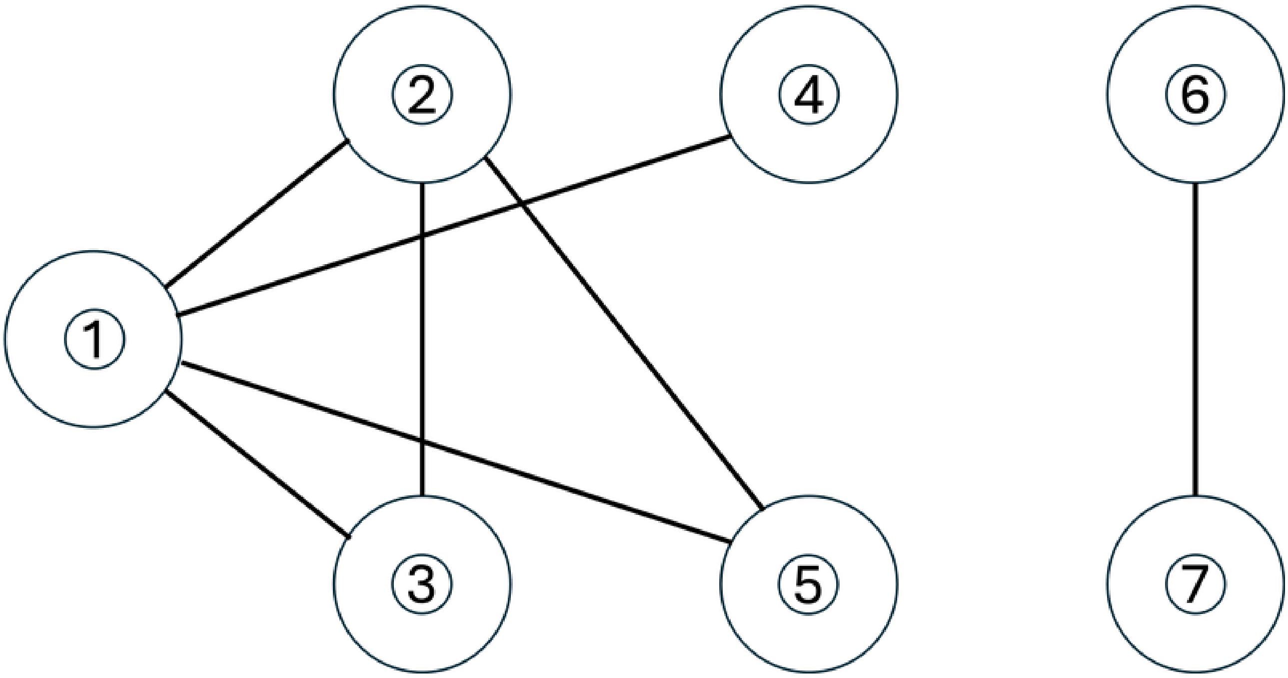
Sample Output 1

Copy

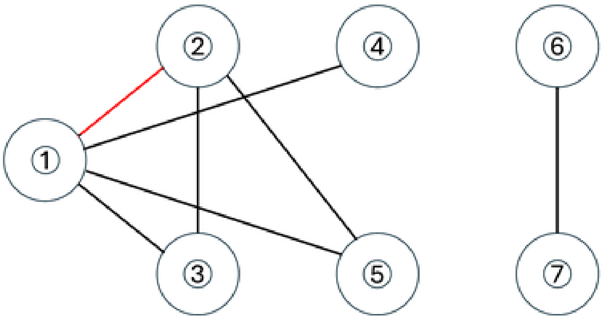
Copy

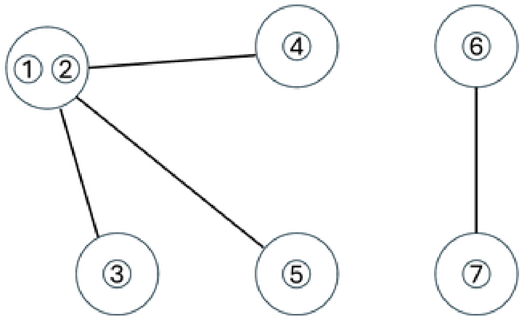
```
4
3
3
3
2
```

Initially, G is as shown in the figure below. The circled numbers represent pieces with those numbers.



In the 1st operation, we contract the edge between the vertices where pieces 1 and 2 are placed (left figure below).
After the operation, G becomes as shown in the right figure below, and in particular, the number of edges is 4. Note that self-loops have been removed and multi-edges have been replaced with simple edges.





In the 2nd operation, we contract the edge between the vertices where pieces 1 and 3 are placed.
After the operation, G becomes as shown in the left figure below, and the number of edges becomes 3.
In the 3rd operation, since pieces 2 and 3 are placed on the same vertex, G remains unchanged, and the number of edges remains 3.
In the 4th operation as well, since pieces 1 and 2 are placed on the same vertex, G remains unchanged, and the number of edges remains 3.
In the 5th operation, we contract the edge between the vertices where pieces 1 and 5 are placed.
After the operation, G becomes as shown in the right figure below, and the number of edges becomes 2.

Thus, output $4, 3, 3, 3, 2$ in this order, separated by newlines.