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Union-Find with Path Compression

locked

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Problem

Submissions

Leaderboard

Discussions

You are expected to maintain a family of disjoint nonempty subsets. Initially, each set contains a single element from $\{1 \dots N\}$ and is named by the element it contains. At any point of time, we need to perform the following operations with the sets.

1. **UNION A B** Modify the family by replacing two sets, the one containing A and the one containing B, by a single set that is the union of these two sets. Nothing changes if a and b are already in the same set. Implementation : You are expected to implement union by rank using **path compression***. If rank of the both sets containing A and B are same then the name of the resulting set of the union would be that of the set containing B (the second argument).

2. **FIND A**

Find the representative of the set containing A.

3. **CC**

Find the number of sets at current instant.

4. **PARENT A**

Find the Parent of the vertex A.

Input Format

First Line contains **N** and **Q** denotes the Number of vertices and Number of Queries.

Next **Q** Lines contains either of the queries *UNION, FIND, CC, PARENT*

Constraints

$$1 \leq N \leq 2 \times 10^5$$

$$1 \leq Q \leq 3N$$

$$1 \leq A \leq N$$

$$1 \leq B \leq N$$

Output Format

- Print the name of the set containing the given element for **FIND** query
- Print the number of sets at current instant for **CC** query
- Print the Immediate Parent of the the given vertex for **PARENT** query

Sample Input 0

```
5 7
UNION 4 3
UNION 1 2
UNION 2 3
PARENT 1
PARENT 2
```

FIND 1
CC

Sample Output 0

2
3
3
2

Explanation 0

UNION 4 3:

As both sets containing 4 and 3 have rank zero, union of set containing 4 and the set containing 3 is done and the name of the result set is made 3. The rank of the result set is increased by one.

UNION 1 2:

As both sets containing 1 and 2 have rank zero, union of set containing 1 and the set containing 2 is done and the name of the result set is made 2. The rank of the result set is increased by one.

UNION 2 3:

As both sets containing 2 and 3 have rank one, union of set containing 2 and the set containing 4 is done and the name of the result set is made 3. The rank of the result set is increased by one.

PARENT 1:

The parent of 1 is 2.

PARENT 2:

The parent of 2 is 3.

FIND 1:

The name of the set containing vertex 1 is 3.

CC:

The number of connected components are 2 now because except vertex 5 all other vertices are in same set.

[f](#) [t](#) [in](#)

Submissions: [64](#)

Max Score: 60

Difficulty: Medium

Rate This Challenge:

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Current Buffer (saved locally, editable)  

C++  

```
1 #include <cmath>
2 #include <cstdio>
3 #include <vector>
4 #include <iostream>
5 #include <algorithm>
6 using namespace std;
7
8
9 int main() {
10     /* Enter your code here. Read input from STDIN. Print output to STDOUT */
11     return 0;
12 }
13
```

Line: 1 Col: 1

 [Upload Code as File](#) ☐ Test against custom input

Run Code

Submit Code

