4484 - Box Relations

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There are n boxes C_1, C_2,..., C_n in 3D space. The edges of the boxes are parallel to the x, y or z-axis. We provide some relations of the boxes, and your task is to construct a set of boxes satisfying all these relations.

There are four kinds of relations ($1 \leq i,j \leq n$, i is different from j):

- `I` i j: The intersection volume of C_i and C_j is positive.
- `X` i j: The intersection volume is zero, and any point inside C_i has smaller x-coordinate than any point inside C_j.
- `Y` i j: The intersection volume is zero, and any point inside C_i has smaller y-coordinate than any point inside C_j.
- `Z` i j: The intersection volume is zero, and any point inside C_i has smaller z-coordinate than any point inside C_j.

Input

There will be at most 30 test cases. Each case begins with a line containing two integers n ($1 \leq n \leq 1,000$) and R ($0 \leq R \leq 100,000$), the number of boxes and the number of relations. Each of the following R lines describes a relation, written in the format above. The last test case is followed by $n = R = 0$, which should not be processed.

Output

For each test case, print the case number and either the word `POSSIBLE' or `IMPOSSIBLE'. If it's possible to construct the set of boxes, the i-th line of the following n lines contains six integers x_1, y_1, z_1, x_2, y_2, z_2, that means the i-th box is the set of points (x, y, z) satisfying $x_1 \leq x \leq x_2$, $y_1 \leq y \leq y_2$, $z_1 \leq z \leq z_2$. The absolute values of x_1, y_1, z_1, x_2, y_2, z_2 should not exceed 1,000,000.

Print a blank line after the output of each test case.

Sample Input

```
3 2
I 1 2
X 2 3
3 3
Z 1 2
Z 2 3
Z 3 1
1 0
0 0
```

Sample Output

```
Case 1: POSSIBLE
0 0 0 2 2 2
1 1 1 3 3 3
8 8 8 9 9 9

Case 2: IMPOSSIBLE

Case 3: POSSIBLE
0 0 0 1 1 1
```

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