Threes Company

Purpose: graphs

Due: July 21^{st}

Description

If you saw the first Twilight file you are aware that Bella is torn between loving Jacob the werewolf- next-door and the shimmers in the sunlight Edward. She is so confused she has entered a series of caves and has gotten herself completely lost. Both Jacob and Edward rush to her rescue. Jacob explores each passage through the caves one by one, clockwise, while Edward explores each passage through the caves one by one counter-clockwise. Each turn, both Edward and Jacob try to move to a new cave. If either reach Bella (who does not move, since she is so distraught), the simulation ends and Bella marries her rescuer. If they both reach her at the same time, Jacob and Edward fight and all 3 of them die as a result.
To complicate matters, in some of the caves there is naturally growing wolf's bane and Jacob cannot enter those. In other caves there is naturally growing garlic which Edward cannot enter. If either boy is moving towards a cave with a plant they are allergic to, he turns around halfway up the passage and ends up back in the cave he just left. When the simulation starts, Jacob takes the smallest numbered passage, while Edward takes the highest numbered passage. After 100 turns, if no one finds Bella, everyone dies of starvation.

Input

All input will be from the keyboard. The input will consist of a number of test cases. The first line of each test case will contain 4 integers separated by a single space. The first integer ($0 < n$) represents the number of caves, the second integer specifies the cave Bella is in (b), followed by the cave Jacob starts in (j) and the cave Edward starts in (e) each separated by a space. Neither Edward nor Jacob will start in a cave that contains an allergen to which they are allergic. The next n lines will specify the layout of the cave system. The i^{th} line of the test case will start with 2 integers. The first integer will be -1, 0, 1 where -1 indicates the presence of garlic in the i^{th} cave and 1 represents the presence of wolf's bane in the cave, while 0 represents the cave is free of allergens. Next will be the integer d_i , the degree of vertex i, followed by d_i integers separated by a single space, which represent the caves adjacent to i in clockwise order. The test case starting with 0 0 0 0 will represent the end of input.

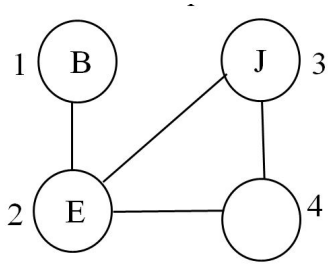

Figure 1: Cave system for sample input.

Output

For each test case there will be 1 line of output with one of the following 3 messages.
`Bella marries Jacob in X moves`
`Bella marries Edward in X moves`
`Everyone dies in X moves`
Where `X` is the number of moves in the simulation

4 1 3 2	In turn 1 Edward heads to 4 and Jacob moves to 2
0 1 2	In turn 2 Edward heads to 3 and Jacob moves to 4
0 3 1 3 4	In turn 3 Edward heads to 2 and Jacob moves to 3
0 2 2 4	In turn 4 Edward heads to 1 and Jacob moves to 2
0 2 2 3	and the simulation ends.

Figure 2: Input for Figure 1, and the corresponding simulation.

Sample Input

```
4 1 3 2
0 1 2
0 3 1 3 4
0 2 2 4
0 2 2 3
4 1 3 2
-1 1 2
0 3 1 3 4
0 2 2 4
1 2 2 3
4 1 3 2
-1 1 2
1 3 1 3 4
0 2 2 4
0 2 2 3
0 0 0 0
```

Corresponding Sample Output

```
Bella marries Edward in 4 moves
Bella marries Jacob in 3 moves
Everyone dies in 101 moves
```

How the program will be graded

Memo

What	pts
Name	1
Time Space Analysis	10
Test Plan with > 3 original nontrivial tests	8

Source Code Document

What	pts
Name	1
Description	4
Style	10
pre/post conditions	10
Functionality	56