Flow Online – Section A
Operation Royal Mint: Escape Route Planning
Time – 35 Minutes

Problem Statement

The Professor has successfully orchestrated the heist at the Royal Mint of Utopia. Now comes the most critical part - the escape. The Professor has mapped out various locations in Amaurot, capital of Utopia, as checkpoints, connected by secret routes known only to the resistance.

Your task is to help the Professor determine the maximum number of completely independent escape routes from the Royal Mint to the designated safe house. Each route must be independent - no two routes can share the same passage between checkpoints, ensuring that if the police block one passage, the other routes remain viable.

The city is mapped as a network where:

- Each location is numbered from 1 to N
- The Royal Mint is always location 1
- The safe house is always location N
- Each passage between locations can only be used by one escape route
- Some passages are one-way due to police patrol patterns

The Professor needs not just the number of independent routes, but also the exact paths for each route to brief the team.

Input Format

Input starts with an integer T (≤ 100), denoting the number of escape scenarios to analyze.

Each scenario begins with two integers N and M ($2 \leq N \leq 100$, $1 \leq M \leq 5000$), where N is the number of locations and M is the number of passages.

Each of the next M lines contains two integers u and v ($1 \leq u, v \leq N$, $u \neq v$), indicating a one-way passage from location u to location v.

Output Format

For each scenario, first print "Case X: Y" where X is the case number and Y is the maximum number of independent escape routes.

If $Y > 0$, print the next Y lines, each containing one escape route. Each route should be printed as a sequence of location numbers from 1 to N, separated by `->`.

If $Y = 0$, print "No escape route possible! The Professor needs a new plan."

Sample Input

```
5
6 8
1 2
1 3
2 4
```

```
3 4
3 5
4 6
5 6
2 5
4 4
1 2
2 3
4 3
4 1
7 10
1 2
1 3
2 4
2 5
3 5
3 6
4 7
5 7
6 7
5 6
5 7
1 2
1 3
2 4
3 4
3 5
4 5
2 5
8 12
1 2
1 3
1 4
2 5
3 5
3 6
4 6
5 7
5 8
6 7
6 8
7 8
```

Sample Output

```
Case 1: 2
1 -> 2 -> 4 -> 6
1 -> 3 -> 5 -> 6
Case 2: 0
```

```
No escape route possible! The Professor needs a new plan.
Case 3: 2
1 -> 2 -> 4 -> 7
1 -> 3 -> 5 -> 7
Case 4: 2
1 -> 2 -> 5
1 -> 3 -> 5
Case 5: 3
1 -> 2 -> 5 -> 8
1 -> 3 -> 6 -> 8
1 -> 4 -> 6 -> 7 -> 8
```

Explanation for Sample Case 1

In the first scenario, we have 6 locations and 8 passages. The Royal Mint (location 1) needs routes to the safe house (location 6).

The network allows for 2 completely independent escape routes:

```
Route1: 1 -> 2 -> 4 -> 6
Route2: 1 -> 3 -> 5 -> 6
```

These routes share no common passages. If the police block any passage in one route, the other route remains completely operational. The Professor can split the team into two groups, each taking a different route to maximize the chances of successful escape.

Note that while passage `2 -> 5` exists, using it would not increase the number of independent routes as it would share passages with the existing routes.