7667 Surviving Probability

A soldier, Raymond, is asked to carry out some military mission at the X region. This region has landmines underground. There are several *military bases* (*bases* for brevity) in the region, some of which are connected by roads such that any two bases can reach each other via at least one road. In addition, any two bases are connected by at most one road, and each road is bidirectional. For convenience, we can view the bases and roads as a graph $G = (V, E)$ in which bases are represented by vertices in V and roads are represented by edges in E. A base is *odd* if there are odd number of roads incident to it; otherwise, it is an *even base*. Each edge (u, v) is associated with a value $r(u, v) = \frac{1}{2^i}$, where $i \geq 0$ is a non-negative integer, which represents the *surviving probability* of passing through road (u, v). Note that $0 < r(u, v) \leq 1$. We assume that the probabilities associated with edges are independent. A *walk* is a list $v_0 \to v_1 \to \cdots \to v_{k-1} \to v_k$ such that, for $1 \leq i \leq k$, vertices v_{i-1} and v_i are adjacent. Note that a walk may contain repeated vertices and edges.

Given two odd bases S and T ($S \neq T$), Raymond would like to find a most reliable $S..T$ *walk*, starting from S and ending at T, that maximizes the surviving probability such that all the roads are passed through at least once (i.e., the product of the surviving probabilities of the edges in the walk is maximum among the other $S..T$ walks). We call such a walk a most reliable $S..T$ walk, and call the product of the surviving probabilities of the edges in this walk the *maximum surviving probability*.

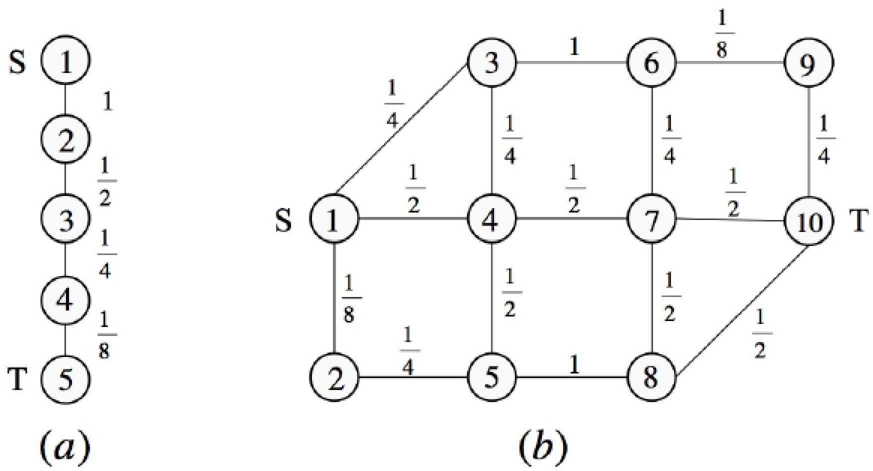

Figure 1: Two examples

For example, as shown in Figure 1(a), "$S = 1 \to 2 \to 3 \to 4 \to 5 = T$" is the only most reliable $S..T$ walk. The maximum surviving probability is $1 \times \frac{1}{2} \times \frac{1}{4} \times \frac{1}{8} = \frac{1}{64} = \frac{1}{2^6}$. In Figure 1(b), there are many desired $S..T$ walks. For example, "$S = 1 \to 3 \to 4 \to 1 \to 2 \to 5 \to 4 \to 7 \to 6 \to 3 \to 4 \to 5 \to 8 \to 7 \to 10 \to 9 \to 6 \to 7 \to 8 \to 10 = T$" and "$S = 1 \to 3 \to 6 \to 9 \to 10 \to 8 \to 5 \to 2 \to 1 \to 4 \to 5 \to 8 \to 7 \to 6 \to 3 \to 4 \to 7 \to 10 = T$" are two $S..T$ walks such that all the roads are passed through at least once. The former is not a most reliable $S..T$ walk (with surviving probability $\frac{1}{2^{28}}$), but the latter one is a most reliable $S..T$ walk with the maximum surviving probability $\frac{1}{2^{22}}$.

Please write a computer program to compute the maximum surviving probability $\frac{1}{2^j}$ of a most reliable $S..T$ walk that passes through all the edges at least once, and output the value j that is the exponent of the base 2 in the denominator of the maximum surviving probability.

Technical Specification

- Graph $G = (V, E)$ is connected.

- $2 \leq |V| \leq 100$.
- $1 \leq |E| \leq \frac{|V|(|V|-1)}{2}$.
- For each edge (u, v), $r(u, v) = \frac{1}{2^i}$, where $0 \leq i \leq 10000$.

Input

The first line of the input contains an integer L ($L \leq 11$) indicating the number of test cases to follow. Each test case consists of a graph $G = (V, E)$, which has the following format: the first line contains four numbers, $n(= |V|)$, $m(= |E|)$, S, and T such that any two consecutive numbers are separated by a single space. The next m lines contain the description of m edges and their surviving probabilities such that each line contains two endpoints of an edge and the exponent of the base 2 in the denominator of the surviving probability corresponding to this edge (any two consecutive numbers are separated by a single space).

Output

The output contains one line for each test case. Each line contains the exponent j of the denominator of the maximum surviving probability $\frac{1}{2^j}$ of a most reliable $S..T$ walk.

Sample Input

```
2
5 4 1 5
1 2 0
2 3 1
3 4 2
4 5 3
10 15 1 10
1 2 3
1 3 2
1 4 1
2 5 2
3 4 2
3 6 0
4 5 1
4 7 1
5 8 0
6 7 2
6 9 3
7 8 1
7 10 1
8 10 1
9 10 2
```

Sample Output

```
6
22
```