

Problem E

Queue Numbers

Input File: *pe.in*
Time Limit: 30 seconds

Problem Description

Let G be a graph with vertex set $V(G)$ and edge set $E(G)$. A vertex ordering σ of G is a bijection from $V(G)$ to $\{1, 2, \dots, |V(G)|\}$. For $u, v \in V(G)$, we write $u <_{\sigma} v$ if $\sigma(u) < \sigma(v)$. A k -queue layout of a graph G consists of a vertex ordering σ and a partition of its edges into k queues such that no two edges in the same queue are nested (i.e., two edges $(u, v), (x, y) \in E(G)$ are *nested* if $u <_{\sigma} x <_{\sigma} y <_{\sigma} v$). Note that, by definition, two edges are not nested if one of their end vertices is the same vertex. The *queue number* of a graph G , denoted by $qn(G)$, is the minimum k such that G has a k -queue layout. For example, see the following figure. Figure 1(a) is a cycle C_6 with six vertices a, b, \dots, f . Figure 1(b) depicts a layout of this C_6 in which $\sigma(a) = 1, \sigma(b) = 2, \sigma(c) = 3, \sigma(d) = 4, \sigma(e) = 5$, and $\sigma(f) = 6$. We can find that Figure 1(b) needs two queues since there are nested edges in this layout, e.g., (a, f) and (b, c) are a pair of nested edges. However, in Figure 1(c), this layout needs exactly one queue.

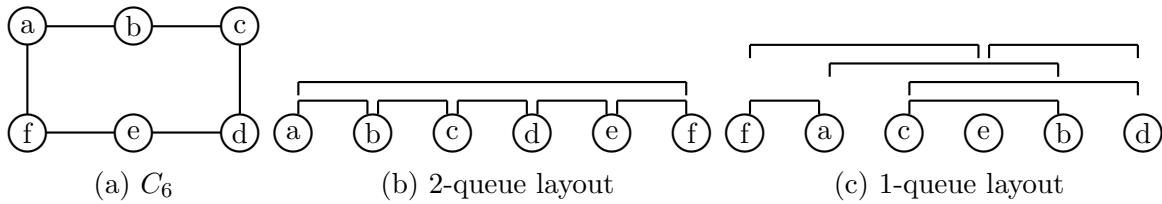


Figure 1: Queue layouts for C_6 .

Given a graph, you are asked to find $qn(G)$.

Input Format

The first line of the input file contains an integer m , $10 \leq m \leq 15$, which represents the number of test cases. In each test case, the first line contains an integer n , $4 \leq n \leq 9$, which is the number of vertices in the graph. The rest lines of each test case contain an $n \times n$ adjacent matrix of the graph. Note that there is a blank (or blanks) to separate two numbers. For example, the graph in the first test case of the sample input is a complete graph K_4 , and the second test case is a C_6 .

Output Format

For each test case, output $qn(G)$ in one line.

Sample Input

```
2
4
0 1 1 1
1 0 1 1
1 1 0 1
1 1 1 0
6
0 1 0 0 0 1
1 0 1 0 0 0
0 1 0 1 0 0
0 0 1 0 1 0
0 0 0 1 0 1
1 0 0 0 1 0
```

Sample Output

```
2
1
```