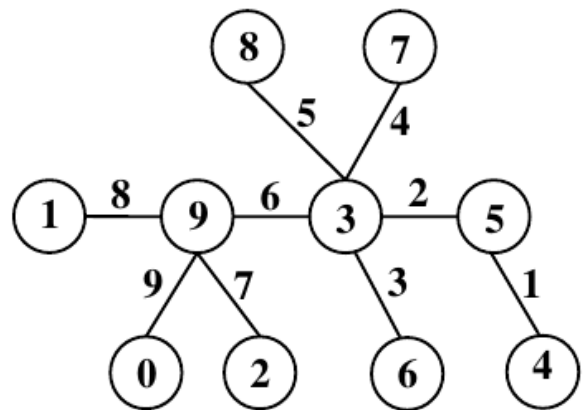


## 7663 Graceful Labeling

In an ideal wireless network, each communication link is assigned with a unique channel number (a positive integer) so that interference can be minimized. A simple scheme to assign channel number for every link in the whole network is as follows. Given a network, each station in the network is first assigned a distinct integer as station ID. Every communication link in the network is then assigned a channel number that is equal to the absolute value of the difference between the station IDs of the two stations linked by this communication link.

In the graph representation of a wireless network on the right, each vertex represents a station and each edge indicates a communication link. Station IDs of 0 to 9 is assigned to the 10 vertices in the graph. The link's channel number can then be computed as described above. For example, the link between vertex with Station ID 3 and vertex with Station ID 7 has a channel number of  $4 (= 7 - 3)$ . Note that in this particular network, all channel numbers are distinct.



A graph  $G = (V, E)$  is called a *graceful graph* if the nodes in  $V$  can be numbered with distinct integers from 0 to  $n - 1$  (where  $n = |V|$ ) and the edges in  $E$  can be numbered with distinct integers from 1 to  $m$  (where  $m = |E|$ ), such that the edge number equals the absolute difference of the two end vertex numbers. Such labeling of a graceful graph is called *graceful labeling* of graph  $G$ .

The channel assignment problem in a wireless network described above can be viewed as finding a graceful labeling for a given network (graph). In order for a graph to be graceful,  $G$  must be without loops or multiple edges. Unfortunately, not every graph has a graceful labeling. Graceful labelings are known to exist for some types of trees including caterpillar graphs. A caterpillar is a tree in which a single path (the spine) is incident to (or contains) every edge. That is, the vertices not on the spine of a caterpillar are leaves. The graph shown above is a caterpillar with a possible graceful labeling. Please write a program to find a graceful labeling of the given caterpillar.

### Technical Specification

1.  $n$ ,  $2 \leq n \leq 30$ , is the number of vertices in  $G$ .
2.  $m$ , is the number of edges in  $G$ .

### Input

The first line of each test case contains an integer  $n$ , denoting the number of vertices in  $G$ . Assume the vertices are  $v_1, v_2, \dots, v_n$ . The second line of a test case contains an integer  $m$ , denoting the number of edges in  $G$ . The next  $m$  lines each contains a pair of integers  $i$  and  $j$  (separated by a space), indicating there is an edge (communication link) between  $v_i$  and  $v_j$ . The last test case will be followed by a line containing a single '0'.

## Output

For each test case, output a single line of  $n$  distinct integers, (ranging from 0 to  $n - 1$ , denoting the assigned station ID of  $v_1, v_2, \dots, v_n$ , respectively, in a graceful labeling of the graph  $G$ . If there are more than one graceful labelings, output only one (any one) of them.

## Sample Input

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

## Sample Output

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