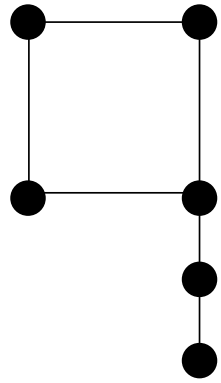
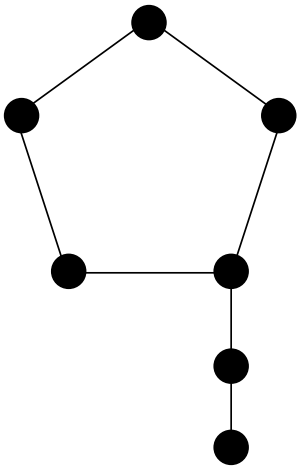
Largest Flagpole

For each test case, you are given an undirected graph with n nodes and m edges. This graph may have more than 1 component. The nodes are labeled 1 to n.

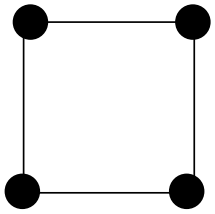
A “flagpole” is a component with a flag and a pole. We define a “flag” as a simple cycle with the number of edges being divisible by 4. The component also must have a “pole”, which is a chain of zero or more nodes with degree 2 and an ending node with degree one. The pole must connect to the flag exactly once.



Valid Flagpole



Invalid Flagpole
# of edges in cycle not divisible by 4



Invalid Flagpole
No pole, only flag

The size of the flagpole is defined by the formula: (# of nodes in flag)^2 + (# of nodes in pole). For each test case. We are tasked with finding the component which is the flagpole with the biggest size. Note that not all components will be flagpoles, however there will always be at least 1 flagpole per test case.

Input:
The first line will contain the number of test cases, t ($1 \le t \le 500$)
The first line of each test case will contain the number of nodes, n, and the number of edges, m ($5 \le n, m \le 10^6$)
The next m lines will contain two integers u_i and v_i representing an undirected edge. The edge connects node u_i to v_i ($1 \le u_i, v_i \le n$).

Output:
For each test case, output the size of the largest flagpole.

Sample Input:
1
17 17
1 2
2 3
3 4
4 1
1 5
5 6
7 8
8 9
9 10
10 11
11 12
12 13
13 9
14 15
15 16
16 17
17 14
Sample Output:
18

Explanation for sample:
(Use picture shown above to visualize the graphs)
Only one valid flagpole with 4 nodes in flag and 2 nodes in pole. $4^2 + 2 = 18$