2015 Mid-Atlantic Regional Programming Contest
Draft November 3, 2015

Problem A: The Scheming Gardener

The Jackstraw Gardening Club is a cooperative of gardeners whose share a common lot of land, parceling it out every year among their members, each of whom gets their own plot of land within the larger lot.

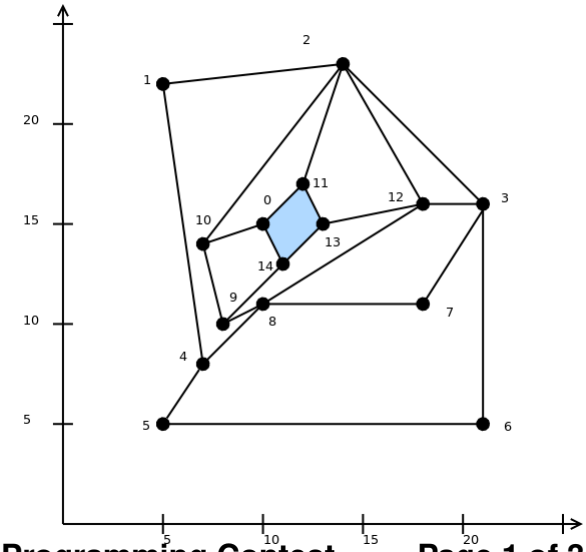
Each winter, before the planting season, the club gathers together on the lot to select their plots. Each member has a handful of wooden stakes and a ball of string. Taking turns in rotation, each member may choose to drive a new stake into the ground, and then may tie a length of string between one or more pairs of stakes, forming a straight-line connection between the two. Strings may not cross (except at the ends where they are tied to same stake) nor may they lie directly atop one another co-linearly. A string may not have both ends tied to the same stake. Stakes may not be driven so close to an existing string or stake that one could not easily step between them.

Each portion of the lot entirely surrounded by strings defines one garden plot. The process continues until a majority of the club members feel that enough enclosed plots have been formed, are willing to stop, subject to the limitations:

- Upon stopping, any useless strings will be removed. A useless string is one where the land just to each side of the string lies in the same plot or in the unenclosed portion of the lot.
- At least one enclosed area must remain after removing the useless strings.
- There will be no enclosed plots of zero area.
- All the remaining strings (after the useless ones are removed) will be connected — it will be possible to trace a path from one string to any other string in the lot.

The gardeners then choose their plots from among the enclosed areas.

You are lucky enough to have the first choice. You know that most of your fellow gardeners will probably try for the largest area plots they can get, but you have a different goal entirely. You are hoping to raise a single, beautiful pumpkin that will win first prize at the next county fair. You don't need much space, but you worry that your pumpkins may be chewed upon by deer, rabbits, mice, and other four-footed wildlife. You want to choose a plot that would force such vermin to cross as many other plots as possible before reaching yours. You hope that the sheer variety of crops presented by the other gardeners will distract the vermin before they ever get to your plot. The vermin will not step directly



on or over a stake, but will always pass it to one side or the other.

Input

Input will consist of 1 or more datasets. Each dataset will begin with a line containing two integers, P, and E. $2 < P \leq 750$, $3 \leq E \leq 1000$. A value of zero for P indicates end of the input.

The first line of the dataset is followed by P lines, each containing x, y coordinates of one point. These will be integers in the range $0 \ldots 10{,}000$. These points will be distinct.

Those lines are followed by E lines, each containing a pair of point numbers, indicating a connection between those two points. These numbers will be in the range $0 \ldots P - 1$ and refer to the order of occurrence of the points in the earlier input, with point 0 being the first such point.

Output

For each dataset, find a plot that maximizes the smallest number of other plots that an animal approaching from outside would need to cross before reaching your chosen one. Print the minimum number of other plots that would need to be crossed by such an animal for your chosen plot.

Example

Here is a possible input:

```
15 23
10 15
5 22
14 23
21 16
7 8
5 5
21 5
18 11
10 11
8 10
7 14
12 17
18 16
13 15
11 13
1 2
2 3
2 12
2 11
```

```
2 10
3 6
3 7
3 12
4 1
4 5
4 8
5 6
7 8
8 9
8 12
9 10
9 14
10 0
11 13
11 0
12 13
13 14
0 14
5 6
0 0
0 10
10 0
10 10
5 6
0 1
0 4
1 4
2 3
2 4
3 4
0 0
```

The output should be:

```
2
0
```

There are two datasets in the above input. The first, which ends with the line containing "0 14", corresponds to the picture shown above. The shaded plot in that picture is the one selected by the scheming gardener.