# Mike and Shortcuts

time limit per test

3 seconds

memory limit per test

256 megabytes

Recently, Mike was very busy with studying for exams and contests. Now he is going to chill a bit by doing some sight seeing in the city.

City consists of *n* intersections numbered from 1 to *n*. Mike starts walking from his house located at the intersection number 1 and goes along some sequence of intersections. Walking from intersection number *i* to intersection *j* requires |*i* - *j*| units of energy. The *total energy* spent by Mike to visit a sequence of intersections *p*1 = 1, *p*2, ..., *pk* is equal to http://codeforces.com/predownloaded/44/8c/448c0e259a30da8dcd84e6438b1754b6cd80a0d3.png units of energy.

Of course, walking would be boring if there were no shortcuts. A *shortcut* is a special path that allows Mike walking from one intersection to another requiring only 1 unit of energy. There are exactly *n* shortcuts in Mike's city, the *ith* of them allows walking from intersection *i* to intersection *ai* (*i* ≤ *ai* ≤ *ai*+ 1) (but not in the opposite direction), thus there is exactly one shortcut starting at each intersection. Formally, if Mike chooses a sequence *p*1 = 1, *p*2, ..., *pk* then for each 1 ≤ *i* < *k* satisfying *pi*+ 1 = *api* and *api* ≠ *pi* Mike will spend **only 1 unit of energy** instead of |*pi* - *pi*+ 1| walking from the intersection *pi* to intersection *pi*+ 1. For example, if Mike chooses a sequence *p*1 = 1, *p*2 = *ap*1, *p*3 = *ap*2, ..., *pk* = *apk*- 1, he spends exactly *k* - 1 units of total energy walking around them.

Before going on his adventure, Mike asks you to find the minimum amount of energy required to reach each of the intersections from his home. Formally, for each 1 ≤ *i* ≤ *n* Mike is interested in finding minimum possible total energy of some sequence *p*1 = 1, *p*2, ..., *pk* = *i*.

**Input**

The first line contains an integer *n* (1 ≤ *n* ≤ 200 000) — the number of Mike's city intersection.

The second line contains *n* integers *a*1, *a*2, ..., *an* (*i* ≤ *ai* ≤ *n* , http://codeforces.com/predownloaded/ea/03/ea038441ad91cbfedeedf4251cf61dea5bea0e3c.png, describing shortcuts of Mike's city, allowing to walk from intersection *i* to intersection *ai* using only 1 unit of energy. Please note that the shortcuts don't allow walking in opposite directions (from *ai* to *i*).

**Output**

In the only line print *n* integers *m*1, *m*2, ..., *mn*, where *mi* denotes the least amount of total energy required to walk from intersection 1 to intersection *i*.

**Examples**

**input**

**Copy**

3  
2 2 3

**output**

**Copy**

0 1 2

**input**

**Copy**

5  
1 2 3 4 5

**output**

**Copy**

0 1 2 3 4

**input**

**Copy**

7  
4 4 4 4 7 7 7

**output**

**Copy**

0 1 2 1 2 3 3

**Note**

In the first sample case desired sequences are:

1: 1; *m*1 = 0;

2: 1, 2; *m*2 = 1;

3: 1, 3; *m*3 = |3 - 1| = 2.

In the second sample case the sequence for any intersection 1 < *i* is always 1, *i* and *mi* = |1 - *i*|.

In the third sample case — consider the following intersection sequences:

1: 1; *m*1 = 0;

2: 1, 2; *m*2 = |2 - 1| = 1;

3: 1, 4, 3; *m*3 = 1 + |4 - 3| = 2;

4: 1, 4; *m*4 = 1;

5: 1, 4, 5; *m*5 = 1 + |4 - 5| = 2;

6: 1, 4, 6; *m*6 = 1 + |4 - 6| = 3;

7: 1, 4, 5, 7; *m*7 = 1 + |4 - 5| + 1 = 3.

题意：n个点标号为1到n，每个点都有一条有向边连向某个点，边权为1，各个点之间都有一条无向边相连，权值为标号的差值，问1号点到其他点的最短路。

# Police Station

time limit per test

2 seconds

memory limit per test

256 megabytes

The Berland road network consists of *n* cities and of *m* bidirectional roads. The cities are numbered from 1 to *n*, where the main capital city has number *n*, and the culture capital — number 1. The road network is set up so that it is possible to reach any city from any other one by the roads. Moving on each road in any direction takes the same time.

All residents of Berland are very lazy people, and so when they want to get from city *v* to city *u*, they always choose one of the shortest paths (no matter which one).

The Berland government wants to make this country's road network safer. For that, it is going to put a police station in one city. The police station has a rather strange property: when a citizen of Berland is driving along the road with a police station at one end of it, the citizen drives more carefully, so all such roads are considered safe. The roads, both ends of which differ from the city with the police station, are dangerous.

Now the government wonders where to put the police station so that the average number of safe roads for **all** the shortest paths from the cultural capital to the main capital would take the maximum value.

**Input**

The first input line contains two integers *n* and *m* (2 ≤ *n* ≤ 100, http://codeforces.com/predownloaded/54/7c/547cae69e37b50da945878d007f9a93350fdde32.png) — the number of cities and the number of roads in Berland, correspondingly. Next *m* lines contain pairs of integers *vi*, *ui* (1 ≤ *vi*, *ui* ≤ *n*, *vi* ≠ *ui*) — the numbers of cities that are connected by the *i*-th road. The numbers on a line are separated by a space.

It is guaranteed that each pair of cities is connected with no more than one road and that it is possible to get from any city to any other one along Berland roads.

**Output**

Print the maximum possible value of the average number of safe roads among all shortest paths from the culture capital to the main one. The answer will be considered valid if its absolute or relative inaccuracy does not exceed 10- 6.

**Examples**

**input**

**Copy**

4 4  
1 2  
2 4  
1 3  
3 4

**output**

**Copy**

1.000000000000

**input**

**Copy**

11 14  
1 2  
1 3  
2 4  
3 4  
4 5  
4 6  
5 11  
6 11  
1 8  
8 9  
9 7  
11 7  
1 10  
10 4

**output**

**Copy**

1.714285714286

**Note**

In the first sample you can put a police station in one of the capitals, then each path will have exactly one safe road. If we place the station not in the capital, then the average number of safe roads will also make http://codeforces.com/predownloaded/8a/51/8a51db14838a9e98e92c47b1d9acf4b982593e25.png.

In the second sample we can obtain the maximum sought value if we put the station in city 4, then 6 paths will have 2 safe roads each, and one path will have 0 safe roads, so the answer will equal http://codeforces.com/predownloaded/1e/b8/1eb8355fc8ea839feaac8b243d60cf5845e44b71.png.

题意：有一个国家共有n个城市，第一个城市为文化城市，第n个城市为经济城市，在各个城市中间有不多于一条道路，且在各个城市之间移动时都是走最短距离。现在要选择一个城市设一个警察站，如果选定的城市为k，则与城市k相连的道路都是安全的，问将警察站建在那个城市才能使得从文化城市到经济城市的平均安全度最高。