Selection Contest for HKU ACM Team 2017

The University of Hong Kong

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Problem A : Tax

The amount of income tax imposed on any taxpayer depends on his/her income. For an income less than or equal to 1,000,000 Oshloobs, no tax is paid. For an income greater than 1,000,000 and less than or equal to 5,000,000 Oshloobs, the tax is 10% of the income. For an income over 5,000,000 Oshloobs, the tax is 20% of the income. You should write a program to calculate the net income of any given employee after the deducted tax.

Input (Standard Input)

There are multiple lines in the input. Each line contains an employee's income before the tax, which is a positive integer, a multiple of 1000, and not greater than 10,000,000. The input terminates with a line containing `0` which should not be processed.

Output (Standard Output)

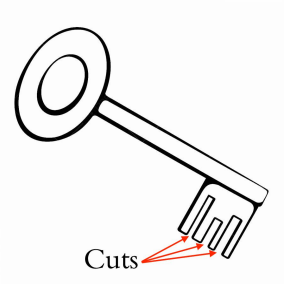
For each employee, output a line containing the net income after the deducted tax.

Sample Input and Output

Standard Input	Standard Output
10000 50000 2000000 7500000 0	10000 50000 1800000 6000000

Problem B : Key Maker

Hassan is a happy key maker. Every customer arrives with a safe-box key, and asks him to create some copies of the key. Each key has several cuts of different depths. The picture below shows a safe-box key with 3 cuts. To make a copy, Hassan needs to make the same number of cuts with exactly the same sequence of depths in a new blank key.



In the first days of his job, Hassan wasted many blank keys to make copies. Most of the copied keys, however, did not match the customer keys and he could not sell them. He collected those copied keys in a trash-box, and now he is thinking of recycling them.

When a new customer arrives, Hassan looks into the trash-box, collects all keys with the same number of cuts as the customer's key, and counts the keys that can match the customer's key. A key can match the customer's key if it already has exactly the same sequence of cut depths, or the depth of some of its cuts can be increased to reach the same sequence. Since this job is too hard for him, he has asked your help. For simplicity, you can assume that in any two keys with the same number of cuts, the position of the cuts along the keys are identical.

Input (Standard Input)

There are multiple test cases in the input. The first line of each test case contains two space-separated integers m as the number of cuts in the customer's key ($1 \leqslant m \leqslant 10$), and n as the number of keys with the same number of cuts in the trash-box ($1 \leqslant n \leqslant 100$). The second line of the test case consists of m space-separated integers, as the depths of cuts in the customer's key. Each of the next n lines also contains m integers, as the depths of cuts in a trash-box key. The depth of cuts in each of these $n + 1$ keys are 1-digit positive integers given in the left-to-right order. The input terminates with a line containing `0 0` which should not be processed.

Output (Standard Output)

For each test case, print a single line containing the number of keys in the trash-box that either match the customer's key or can be cut to match it.

Sample Input and Output

Standard Input	Standard Output
4 1 3 2 1 3 2 2 1 2 4 1 4 2 2 2 3 2 2 3 5 3 2 2 4 2 2 2 3 4 3 2 1 1 3 2 2 2 2 2 2 2 0 0	1 0 2

Problem C : IOI 2017 Logo

Iran is the host of the International Olympiad in Informatics (IOI) 2017. In order to design the IOI 2017 logo, the organizing committee of the IOI 2017 decided to publicly call for logos. It was not surprising that many logos were received in a short time as the young generation in Iran is actively taking part in any national event. In the first round, logos were judged by some professional graphic designers, and the best logos being artistically capable to be the IOI 2017 logo were selected to be judged in the second round.

The selected logos are now presented to the organizing-committee members for voting. The voting system is a little bit complicated: each member can vote for at most three different logos in some order. The first, second and third choices of each member are awarded 3, 2 and 1 points, respectively. The score of a logo is the total points the logo receives from all members. The logo with the highest score is the winner. In the case of ties, the winner is the logo with higher number of first votes. Again, if some logos have the same score and first votes, the logo with more second votes is the winner. If we still have ties, all of them would be winners. Given the voting information, your job is to identify the winner logo (or logos).

Input (Standard Input)

There are multiple test cases in the input. The first line of each test case contains a positive integer n denoting the number of voters ($1 \leqslant n \leqslant 100$). Each of the next n lines starts with an integer d_i, representing the number of logos chosen by the i-th voter ($1 \leqslant d_i \leqslant 3$), followed by d_i different logo IDs showing the choices of that voter (from left to right). Each logo ID is a positive integer not exceeding 10^6. All integers in a line are separated with a single space. The input terminates with a line containing `0` which should not be processed.

Output (Standard Output)

For each test case, output a line containing the winner logos in the increasing order of their IDs. Logo IDs in a line must be separated with a single space.

Sample Input and Output

Standard Input	Standard Output
4 3 5 2 1 3 12 5 2 2 1 2 3 2 1 5 2 3 3 2 1 3 2 3 1 0	2 2 3

Problem D : MicroRNA Ranking

Ahlaam is a computer science student, doing her master thesis on a bioinformatics project about MicroRNAs, special molecule types found in cells. During her thesis, she wants to find microRNAs relevant to a specific health factor in human beings.

Ahlaam has designed k microRNA ranking algorithms, each of which ranks microRNAs from a specific point of view. There are n microRNAs numbered 1 through n, and each algorithm produces one permutation of these n microRNAs. In the permutation produced by each algorithm, the first microRNA is inferred by the algorithm as the most relevant one to the health factor, and the last microRNA is inferred as the least relevant one.

Ahlaam wants to report a *consensus* ranking on microRNAs. In a consensus ranking, if microRNA i is ranked before another mircroRNA j, then at least half of the algorithms should have ranked i before j. Write a program to help Ahlaam find a consensus ranking.

Input (Standard Input)

There are multiple test cases in the input. The first line of each test contains two space-separated integers n ($1 \leqslant n \leqslant 1000$) and k ($1 \leqslant k \leqslant 200$), the number of microRNAs and the number of ranking algorithms, respectively. Then, there are k lines, where the i-th line contains a permutation of n numbers $1, \ldots, n$, representing the output of the i-th ranking algorithm. The input terminates with a line containing `0 0` which should not be processed.

Output (Standard Output)

For each test case, print a single line containing a permutation of n numbers $1, \ldots, n$, representing a possible consensus ranking. If there are more than one correct consensus rankings, print the first one in lexicographic order (a sequence $a_1, \cdots, a_n$ is lexicographically less than a sequence $b_1, \cdots, b_n$ iff there exists a positive integer j such that $a_i = b_i$ for all $1 \leqslant i \leqslant j - 1$ and $a_j < b_j$) . If no such a ranking exists, write "`No solution`" instead.

Sample Input and Output

Standard Input	Standard Output
5 3 3 2 4 1 5 4 1 5 2 3 2 4 5 1 3 5 2 5 4 3 2 1 1 2 3 4 5 4 3 1 4 2 3 4 2 3 1 3 1 2 4 0 0	2 4 1 5 3 1 2 3 4 5 No solution

Problem G : Elections

Jenabkhan who has become billionaire from his Laboo bussiness, is now running for president. His country uses a strange mechanism, so-called electoral college, to select the president. There are several states in the country, and each state counts the votes independently. Depending on the population, each state has some members in the electoral college, and all of those members will vote the candidate with the majority of votes in their state. In the case of ties, each state has some tie-break rule to announce the clear winner. The president will be the candidate who receives more than half of votes in the electoral college.

Given the chance of Jenabkhan to win in each state, compute his winning probability in the electoral college.

Input (Standard Input)

The input consists of several test cases. Each test case starts with a line containing a single integer n denoting the number of states ($1 \leqslant n \leqslant 1000$). Each of the next n lines contains a real value p_i with at most 4 digits after the decimal point ($0 \leqslant p_i \leqslant 1$) and a positive integer e_i, specifying the winning probability of Jenabkhan in the i-th state and the number of electoral votes associated with that state, respectively. The total number of members in the electoral college is an odd number and is no more than 2000. The input terminates with a line containing 0 which should not be processed.

Output (Standard Output)

For each test case, output in a single line containing the winning probability of Jenabkhan, rounded to exactly four digits after the decimal point (e.g., 0.3000 is correct while 0.3 is not).

Sample Input and Output

Standard Input	Standard Output
1 0.4 1 3 0.5 1 0.5 2 0.5 10 3 0.5 1 0.5 2 0.5 2 2 0.2 1 0.8 10 2 0.25 1 0.751 10 0	0.4000 0.5000 0.5000 0.8000 0.7510