Naan

JOI Curry Shop is famous for serving very long naans. They have L kinds of flavors, numbered from 1 through L, to flavor naans. "JOI Special Naan" is the most popular menu in the shop. The length of the naan is L cm. We define "the position x" as the position on the naan which is x cm distant from the left end of the naan. The segment between position $j-1$ and position j is flavored by flavor j $(1 \leq j \leq L)$.

N people came to JOI Curry Shop. Their preferences are different from each other. Specifically, when the i-th $(1 \leq j \leq L)$ person eats naan with flavor j $(1 \leq j \leq L)$, they will get happiness $V_{i,j}$ per 1 cm.

They ordered only one JOI Special Naan. They will share the naan in the following manner:

1. Choose $N-1$ rational numbers $X_1, \ldots, X_{N-1}$ which satisfy $0 < X_1 < X_2 < \cdots < X_{N-1} < L$.
2. Choose N integers $P_1, \ldots, P_N$ which form a permutation of $1, \ldots, N$.
3. For each k $(1 \leq k \leq N-1)$, cut the naan at the position X_k. Thus, the naan will be separated into N pieces.
4. For each k $(1 \leq k \leq N)$, give the piece between the position X_{k-1} and position X_k to the P_k-th person. We consider X_0 as 0 and X_N as L.

We want to distribute the naan fairly. We say a distribution is **fair** if each person gets happiness of more than or equal to $\frac{1}{N}$ of the amount of happiness they will get by eating the whole JOI Special Naan.

Write a program which, given the information of preferences of N people, determines if it is possible to distribute the naan in a fair way, and if it is possible, finds such a fair way.

Input

Read the following data from the standard input. All the values in the input are integers.

N L
$V_{1,1}$ $V_{1,2}$ $\cdots$ $V_{1,L}$
$\vdots$
$V_{N,1}$ $V_{N,2}$ $\cdots$ $V_{N,L}$

Output

Write to the standard output. If it is impossible to distribute naan in a fair way, write -1 in a line. If it is possible, output $N-1$ rational numbers $X_1, \ldots, X_{N-1}$ and N integers $P_1, \ldots, P_N$ which represent a fair distribution, in the following format.

A_1 B_1
A_2 B_2
$\vdots$
A_{N-1} B_{N-1}
P_1 P_2 $\cdots$ P_N

A_k and B_k are a pair of integers which satisfies $X_k = \dfrac{A_k}{B_k}$ $(1 \leq k \leq N-1)$. These integers have to follow the "Constraints of Output" section.

Constraints of Input

- $2 \leq N \leq 2\,000$.
- $1 \leq L \leq 2\,000$.
- $1 \leq V_{i,j} \leq 100\,000$ $(1 \leq i \leq N,\ 1 \leq j \leq L)$.

Constraints of Output

If it is possible to distribute the naan in a fair way, the output must satisfy the following constraints:

- $1 \leq B_k \leq 1\,000\,000\,000$ $(1 \leq k \leq N-1)$.
- $0 < \dfrac{A_1}{B_1} < \dfrac{A_2}{B_2} < \cdots < \dfrac{A_{N-1}}{B_{N-1}} < L$.
- $P_1, \ldots, P_N$ is a permutation of $1, \ldots, N$.
- In the distribution, the amount of happiness which i-th person will get is more than or equal to $\dfrac{V_{i,1} + V_{i,2} + \cdots + V_{i,L}}{N}$ $(1 \leq i \leq N)$.

A_k and B_k are **not** necessary to be coprime $(1 \leq k \leq N-1)$.

Under the constraints of the input, it can be proved that if a fair distribution exists, there is a correct output which satisfies $1 \leq B_k \leq 1\,000\,000\,000$ $(1 \leq k \leq N-1)$.

Subtasks

1. (5 points) $N = 2$.
2. (24 points) $N \leq 6$, $V_{i,j} \leq 10$ ($1 \leq i \leq N$, $1 \leq j \leq L$).
3. (71 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
2 5 2 7 1 8 2 3 1 4 1 5	14 5 2 1

In this sample, the first person will get happiness of $2 + 7 + 1 + 8 + 2 = 20$ when she eats the whole naan and the second person will get happiness of $3 + 1 + 4 + 1 + 5 = 14$ when she eats the whole naan. Thus, if the first person gets happiness of more than or equal to $\frac{20}{2} = 10$ and the second person gets happiness of more than or equal to $\frac{14}{2} = 7$, the distribution is fair.

If you cut the naan at the position $\frac{14}{5}$, the first person will get happiness of $1 \times \frac{1}{5} + 8 + 2 = \frac{51}{5}$ and the second person will get happiness of $3 + 1 + 4 \times \frac{4}{5} = \frac{36}{5}$. Hence, this is a fair distribution.

Sample Input 2	Sample Output 2
7 1 1 2 3 4 5 6 7	1 7 2 7 3 7 4 7 5 7 6 7 3 1 4 2 7 6 5

In this sample, the naan has only one flavor. If you equally divide the naan into 7 pieces, the distribution will be fair, regardless of $P_1, \ldots, P_N$.

Sample Input 3	Sample Output 3
5 3 2 3 1 1 1 1 2 2 1 1 2 2 1 2 1	15 28 35 28 50 28 70 28 3 1 5 2 4

Note that A_k and B_k are not necessary to be coprime ($1 \le k \le N - 1$).