B1 - Hungarian Algorithm in $O(n^4)$

Time Limit: 1 sec.

Problem Description

Implement the Hungarian Algorithm that solves the min-cost perfect matching problem in $O(n^4)$ time.

Input Format

The first line consists of an integer n, the size of the two partite sets in G. The next n lines describe an $n \times n$ matrix, where the entry in the i^{th}-row, j^{th}-column denotes the weight of the edge between the i^{th} vertex in the left partite set and the j^{th} vertex in the right partite set.

You may assume that

- The vertices in the two partite sets are numbered from 0 to $n - 1$, respectively.
- $1 \leq n \leq 100$.
- The weight of the edges is between 1 and 10^6.

Output Format

In the first line, print the total weight of the min-cost perfect matching for G. In the following n lines, print the endpoints of the edges in the matching, separated by a space, one edge per line.

If there are multiple answers, you can print any of them.

Sample Input

```
3
3 1 2
6 5 4
3 7 2
```

Sample Output

```
8
0 1
1 2
2 0
```

B2 - Hungarian Algorithm in $O(n^3)$

Time Limit: 1 sec.

Problem Description

Implement the Hungarian Algorithm that solves the min-cost perfect matching problem in $O(n^3)$ time.

Input Format

The first line consists of an integer n, the size of the two partite sets in G. The next n lines describe an $n \times n$ matrix, where the entry in the i^{th}-row, j^{th}-column denotes the weight of the edge between the i^{th} vertex in the left partite set and the j^{th} vertex in the right partite set.

You may assume that

- The vertices in the two partite sets are numbered from 0 to $n-1$, respectively.
- $1 \leq n \leq 500$.
- The weight of the edges is between 1 and 10^6.

Output Format

In the first line, print the total weight of the min-cost perfect matching for G. In the following n lines, print the endpoints of the edges in the matching, separated by a space, one edge per line.

If there are multiple answers, you can print any of them.

Sample Input

```
3
3 1 2
6 5 4
3 7 2
```

Sample Output

```
8
0 1
1 2
2 0
```