

Problem H. Matrices dot product

Input file: standard input
 Output file: standard output
 Time limit: 1 second
 Memory limit: 256 megabytes

You are given $n \times n$ matrix S and integer k , $2^k \leq n$. Consider the following matrix recurrent:

$$T_0 = (1)$$

$$T_{i+1} = \begin{pmatrix} T_i \cdot a_{00} & T_i \cdot a_{01} \\ T_i \cdot a_{10} & T_i \cdot a_{11} \end{pmatrix}$$

where

$$A = \begin{pmatrix} a_{00} & a_{01} \\ a_{10} & a_{11} \end{pmatrix}$$

is a constant 2×2 matrix.

Find the minimum and maximum values of dot products of matrix T_i and every continuous $2^i \times 2^i$ submatrix of S for each i such as $0 \leq i \leq k$.

Dot product of matrices $\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}$ and $\begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & b_{n2} & \cdots & b_{nn} \end{pmatrix}$ is $\sum_{i=1}^n \sum_{j=1}^n a_{ij} \cdot b_{ij}$.

Input

First line contains 2 integers n, k ($1 \leq n \leq 1000, 1 \leq 2^k \leq n$).

Each of the next n lines contains n integers, j -th integer of i -th line is S_{ij} ($-10^9 \leq S_{ij} \leq 10^9$).

Each of the next 2 lines contains 2 integers in the same format, denoting matrix A . Elements of A do not exceed 2 by absolute value.

Output

Print $k + 1$ lines. $(i + 1)$ -th line should contain 2 integers — the minimum and the maximum dot product of continuous submatrices of S and T_i .

Examples

standard input	standard output
3 1	-10 13
9 -3 13	-30 22
0 10 3	
10 -10 0	
1 -1	
-1 1	