Alas. Geometric Progressions

Given two geometric progressions $\{a_i\}_{i=0}^{n_a-1}$ and $\{b_j\}_{j=0}^{n_b-1}$ where $a_i = a_0 p^i$, $b_j = b_0 q^j$. Find the number of distinct integers that belong to at least one of these progressions.

Input

There are multiple test cases in the input file terminated by EOF. For each test case, there are six integers a_0, p, n_a, b_0, q, n_b. $(0 \le a_0, p, b_0, q \le 5 \times 10^8; 1 \le n_a, n_b \le 100500)$.

Output

For each test case, output the desired number in a line.

Sample Input

```
3 2 5 6 2 5
3 2 5 2 3 5
1 1 1 0 0 1
3 4 100500 48 1024 1000
```

Sample Output

```
6
9
2
100500
```

(Almost empty page.)

Blah. Module Sequence

Given four integers K, N, A and B. Generate an integer list of length $B - A + 1$ using the following recursive definition:

```
X[0] = (K * A) MOD N
(note that K * A may overflow a 64-bit integer variable.)

X[i] = (X[i-1] + K) MOD N
```

Given another two integers L and U, find the number of elements in the list which are between L and U, inclusively.

Input

There are multiple test cases in the input file terminated by EOF. For each test case, there are 6 integers K, N, A, B, L, U in a line. $0 \leq K \leq 10^{10}$, $1 \leq N \leq 10^{10}$, $0 \leq A \leq B \leq 10^{10}$, $0 \leq L \leq U \leq N - 1$.

Output

For each test case, please output the desired number.

Sample Input

```
2 7 1 5 2 5
9 1 0 7 0 0
20 12 21 30 1 11
30 89 112 200 80 88
890 1000 1000 10000 456 980
```

Sample Output

```
3
8
6
9
4770
```

(Almost empty page.)

Cola. Yet Another Hamiltonian Path

A Hamiltonian path in an undirected graph with N vertices is a sequence of vertices $A_1, A_2, \ldots, A_N$ such that all A_i are pairwise distinct and for each i $(1 < i \leq N)$, there is an edge between vertices A_{i-1} and A_i. A path starts at vertex A_1 and visits each vertex of the sequence in order, ending at vertex A_N. The cost of a path is the sum of the weights of the edges connecting the path's consecutive vertices.

You're given a graph where the i-th (0-based) vertex is labeled with String $Label_i$. There is an edge between each pair of vertices. The cost of the edge between vertices i and j is equal to $|Label_i|^2 + |Label_j|^2 - |LCP(Label_i, Label_j)|^2$, where $|X|$ is the length of string X and $LCP(X, Y)$ is the longest common prefix of strings X and Y.

Find the minimum possible cost of a Hamiltonian path which starts at vertex 0 and ends at vertex 1.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line contains an integer N, for the next N lines are strings $Label_0, Label_1, \ldots, Label_{n-1}$. Each string will have length ≤ 50 and contains lowercase letters only. $2 \leq N \leq 50$.

Output

For each test case output the desired number in a line.

Sample Input

```
3
home
school
pub
4
school
home
pub
stadium
4
abcd
aecgh
abef
aecd
7
canada
cyprus
croatia
colombia
chile
china
cameroon
```

Sample Output

```
70
167
91
509
```

(Almost empty page.)

Dora. Crouching Amoebas

Little Romeo is being attacked by amoebas crouching on the floor of his room. His room can be represented as a Cartesian plane, and the amoebas can be represented as points on that plane. You are given a list of points with their x-coordinates and y-coordinates. Multiple amoebas can exist at the same coordinates.

To escape, Romeo must destroy as many amoebas as possible. He has two powers at his disposal. First, he can choose one amoeba and move it along either of the axes by one unit. He can do this at most T times, choosing any amoeba each time. Then, he can choose an $A \times A$ square on the plane and use his SuperAmoebaDestroyer to destroy all amoebas inside or on the border of that square. The square must have sides parallel to the axes.

Return the maximum number of amoebas Romeo can destroy.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

There are 3 integers in the first line. They are n, A and T. ($1 \leq n \leq 30, 1 \leq A \leq 10^9, 1 \leq T \leq 15$). The second line contains n integers, the i-th integer represents the x-coordinate of i-th point. The third line contains n integers, the i-th integer represents the y-coordinate of i-th point.

Output

For each test case please output the answer.

Sample Input

```
2 1 1
0 0
0 1
3 1 1
0 1 2
1 2 0
3 1 2
0 1 2
1 2 0
4 2 4
0 0 3 3
0 3 0 3
2 1 15
-1000000000 1000000000
-1000000000 1000000000
```

Sample Output

```
2
2
3
4
1
```

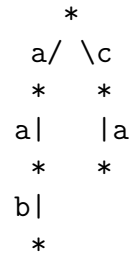
(Almost empty page.)

Emma. Prefix Tree

A prefix tree (also called trie) is a rooted tree data structure used to efficiently store a set of words, S. In a trie every edge has a letter associated with it. Every node in the trie is associated with the string which we get when we read all the edge letters on the path from the root to this node. So the root of the trie is associated with the empty string and every leaf of the trie is associated with some word from S.

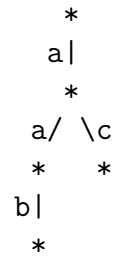
A trie is constructed so that from each node at most one child edge is associated with each letter. So not only do all the descendants of a node have a common prefix (which is the string associated with this node) but also every word with this string as prefix is the descendant of this node. It is necessary that for every word from S there is a node in trie with which is this word associated.

An example of a trie for the set of words `{"aab", "ca"}`:



It is not hard to see that if we change the order of letters in the given words then we will get a different trie (constructed from these different words) which might possibly have fewer nodes.

For example the trie constructed from words `{"aab","ca"}` would have 6 nodes (see image above), but if we change `"ca"` to `"ac"` then the trie would have only 5 nodes:



Given n strings, you are allowed to permute the letters in each word in any way you like. Find the optimal permutation of the letters of the words so the trie constructed from them would have the minimal number of nodes.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

First line contains an integer n ($1 \leq n \leq 16$), next n lines contains n strings, and each of the string has length between 1 and 50 inclusively and contains only lower case letters.

Output

For each test case please output the desired answer.

Sample Input

```
1
ntujudge
2
ntujudge
ntujudge
2
aab
ca
3
aab
ca
ba
3
ab
cd
ef
3
a
aa
aaa
```

Sample Output

```
9
9
5
5
7
```

Fugu. Infinite Lab

There is an infinite labyrinth somewhere on Earth. It has an infinite number of rows, a fixed number W of columns and consists of 1×1 cells. Each cell can be in one of three states: free cell with a teleport, free cell without a teleport and blocked cell. It is known that each row in the labyrinth contains either 0 or 2 cells with teleports.

The rows and columns of the labyrinth are numbered using integers. The rows are infinite in both directions, so for every integer i (including negative integers) there's a row numbered i. The columns are numbered 0 to $W - 1$, inclusive. A cell in row i and column j is denoted as (i, j).

If you are located in a free cell (i, j), you can perform one of the following actions:

- Walk to another free cell (x, y) adjacent by side to (i, j). In other words, (x, y) must be such that $|i - x| + |j - y| = 1$. It is impossible to walk outside of the labyrinth.
- If cell (i, j) contains a teleport, you can use it to be transferred to another free cell from the same row that contains a teleport (there's always exactly one such cell). Note that when you are located in a cell with a teleport, it isn't necessary to use the teleport.

Each of the described two actions, that is, walking to an adjacent cell and using a teleport, counts as one move.

You are given a map containing H rows (strings), with each string consisting of W characters. The character j in i-th string of map represents the state of cell (i, j), where '`#`' means a blocked cell, '`.`' means a free cell and '`T`' means a free cell with a teleport. Both indices i and j are 0-based, so map describes the states of all cells in rows 0 to $H-1$, inclusive. For all other cells the following rule applies: the state of cell (i, j) is exactly the same as the state of cell (x, j) if $|i - x|$ is divisible by H. In other words, the given pattern of H rows is repeated an infinite number of times.

Find the minimum number of moves needed to get from cell (r_1, c_1) to cell (r_2, c_2). If it is impossible, output `-1`.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

First line contains two integers H and W, then follows the map within next H rows. Last line contains four integers r_1, c_1, r_2, c_2. ($1 \le H, W \le 20$; $-10^{15} \le r_1, r_2 \le 10^{15}$; $0 \le c_1, c_2 \le W - 1$.)

Output

For each test cases please output the desired answer.

Sample Input

```
4 6
#...##
.##...
..#.##
#.#.##
1 0 5 3
4 5
##.#.
.#T#T
...#.
##.#.
7 4 1 0
4 10
..######.#
.###T###.T
..T#.##T##
.######..#
1 0 6 4
3 5
..#..
.#.#.
.....
-29 2 19 2
5 5
.#.#.
..#..
.....
.....
..#..
-999 3 100 2
```

Sample Output

```
7
9
11
54
-1
```

Gala. The Boring Game

John and Brus are very bored. That's why they decided to invite their friend and play a boring shooter game. John and Brus are on the first team and the friend is the only player of the second team. The game consists of X rounds. During a round players may shoot each other, but a player can't shoot himself. If a player shoots some player from the opposite team his score is increased by one and if he shoots his teammate his score is decreased by one. Once a player is shot, he can't shoot other players and other players can't shoot him until the end of the current round. A round ends when all the players on one of the teams are shot.

You are given six integers. $scoreJ$, $scoreB$ and $scoreF$ are scores of John, Brus and the friend respectively. $killedJ, killedB$ and $killedF$ are the number of times John, Brus and the friend were shot respectively. Output two integers, where the first integer is the smallest possible value of X and the second integer is the largest possible value of X. If there are no possible values of X, output `-1 -1` in a line.

Input

There are multiple test cases in the input file terminated by EOF. For each test case, there are six integers $scoreJ, killedJ, scoreB, killedB, scoreF, killedF$. All scores are between -1000 and 1000 inclusively, while all killed values are between 0 and 1000, inclusive.

Output

For each test case, please output the desired answer in a line.

Sample Input

```
1 1 1 1 2 2
0 0 0 0 0 0
4 7 -2 5 1 9
1 5 -1 4 3 6
```

Sample Output

```
2 3
0 0
-1 -1
8 9
```

(Almost empty page.)

Haha. Batman and Robin

Batman is assigning the night surveillance activities for himself and Robin. Batman will assign a convex area of the plane to himself, and another convex area to Robin. To avoid jurisdictional problems, assigned areas must not intersect or touch each other. The surveilled area is then the union of the area surveilled by Batman and the area surveilled by Robin. There are several conflictive points in the city that need to be patrolled, so the assignment Batman will do needs to make sure all those points lay within the surveilled area or on its boundary.

Night surveillance is a very time and power consuming task. The power needed by either Batman or Robin to do the surveillance of a given area, measured in bat-units, is exactly the surface of the area. Batman is very lazy and wants to consume the minimum of his own power, but he does not care about Robin's consumption. However, since he is the most experienced and the leader of the team, and in order to keep Robin from suspecting he is lazy, he never assigns to Robin an area strictly larger than the area he assigns to himself.

You will be given two array of n integers, first array contains all X-coordinates and second array contains all corresponding Y-coordinates. Find the minimum power Batman will need for a night of surveillance if he optimizes the assignment of the areas.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

First line contains an integer n ($1 \leq n \leq 50$). The next n integers represent X-coordinates. The another next n integers representing the corresponding Y-coordinates. All coordinates have values between -1000 and 1000, inclusive.

Output

For each test case, please output the desired answer in a line.

Sample Input

```
8
100 100 90 90 -100 -100 -90 -90
100 90 100 90 -100 -90 -100 -90
6
-1000 -1000 1000 1000 1000 -1000
-1000 1000 -1000 1000 0 0
5
-1000 -1000 1000 1000 0
-1000 1000 -1000 1000 0
30
-904 -812 -763 -735 -692 -614 -602 -563 -435 -243
-87 -52 -28 121 126 149 157 185 315 336
390 470 528 591 673 798 815 837 853 874
786 10 -144 949 37 -857 -446 -969 -861 -712
5 -972 -3 -202 -845 559 -244 -542 -421 422
526 -501 -791 -899 -315 281 -275 467 743 -321
```

Sample Output

```
100.0
0.0
1000000.0
1067472.0
```