Problem 1. How earthworms spend the winter

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

To survive the winter, ducks fly south, frogs dive to the bottom of lakes, and earthworms crawl into burrows deep in the soil. A system of passages in the burrow can be presented as a graph, with the edges of the graph corresponding to passages of different length, and the nodes denoting the ends of passages. It is guaranteed that the path from the entrance of the burrow to its every point exists and it is unique.

The width of the passages is only enough for one earthworm to pass through even without the possibility to turn inside. However, when an end of an earthworm is located in the node, it will not prevent other earthworms from crawling through. All earthworms have the same length L.

You need to find the maximum number of earthworms that the burrow can accommodate.

Input

The first line contains two integer numbers N and L separated by space. N is the number of nodes in the graph ($2 \le N \le 10^5$) and L is the length of an earthworm ($1 \le L \le 1000$).

The second line contains a sequence of $N-1$ numbers $A_0, \ldots, A_{N-2}$ ($0 \le A_i \le i$), where A_i is the index of the node that is connected by an edge with the node $i+1$.

The third line contains $N-1$ integer numbers $B_0, \ldots, B_{N-2}$ ($1 \le B_i \le 100$), where B_i is the length of the edge connecting the node A_i with the node $i+1$.

Output

Print a single line containing an integer denoting the maximum number of earthworms that the burrow can accommodate.

Examples

standard input	standard output
3 2 0 1 3 4	3

Problem 2. Weights set

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

Sterlet retailer needs a set of weights for the sterlet. The sterlet can weigh up to M g. From the previous retailer, the current one received N weights. Help the retailer to find out what is the minimum number of weights of arbitrary positive value that he will need to buy. He should be able to obtain any positive integer weight from 1 to M using the set.

Input

The first line contains two positive integers N and M separated by a space. N is the number of existing weights and M is the maximum possible weight of the sterlet.

The second line contains N positive integers denoting values of existing weights, each of them not exceeding 10^9.

Output

Print a single line containing an integer denoting the minimum number of weights that the retailer will need to buy to be able to obtain any integer weight from 1 to M.

Examples

standard input	standard output
3 30 2 3 7	3

Problem 3. Cuboid

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

A rectangular cuboid with edges of integer lengths resides on the first octant. It is aligned with the coordinate axes and one of the corners is at the origin. The cuboid is divided into unit cubes by planes $X = const$, $Y = const$, $Z = const$, where $const$ runs through various integer values. Resulting vertices of unit cubes are indexed in the following way:

1. The vertices residing on the plane $Z = 0$ are indexed first, then the vertices on the plane $Z = 1$, etc.;
2. On every plane $Z = const$, the vertices with the coordinate $Y = 0$ are indexed first, then the vertices with $Y = 1$, etc.;
3. The vertices with fixed coordinates Y and Z are indexed in ascending order of their X coordinate;
4. The indices are 1-based.

Given the number of vertices along each axis, find the sum of indices of the vertices residing on every face of the initial cuboid.

Input

A single line contains three space-separated integers Nx, Ny, Nz, $2 \le Nx, Ny, Nz \le 1000$, denoting a number of vertices along X, Y and Z axis respectively.

Output

Print a single line containing 6 space-separated integers denoting sums of indices of the vertices residing on the faces of the cuboid in ascending order.

Examples

standard input	standard output
2 4 3	36 57 93 144 156 164

Problem 4. Lost coordinates

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

N distinct points with positive integer coordinates resided on a plane. The points were sorted in ascending order of the sum of their coordinates, and in case of equal sums – in ascending order of their X coordinate, and then they were written out. In time, both points and their Y coordinates wore off. Given the remaining sequence of the X coordinates, find the smallest possible Y coordinate of the last point.

Input

The first line contains one integer N, $2 \le N \le 10\,000$, denoting the number of points. The second line contains N space-separated positive integers denoting X coordinates of the points sorted as described above. All integers do not exceed 10 000.

Output

Print a single line containing an integer denoting the smallest possible Y coordinate of the last point of the described sequence.

Examples

standard input	standard output
5 4 1 2 3 4	2

Problem 5. Sheets of paper

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 MiB

There are N rectangular sheets of paper on a table. To free space on the table, the sheets are stacked up using the following rules:

1. One sheet should be stacked on top of another in such way so their left bottom corners coincide and edges are aligned (sheets can be rotated 90°);
2. One sheet can be stacked on top of another only if no part of the top sheet is beyond the borders of the bottom sheet.

Find the minimum number of stacks that can be obtained from stacking up all of the sheets.

Input

The first line contains one integer N, $1 \le N \le 10\ 000$, denoting the number of sheets. Each of the following N lines contains two space-separated positive integers, not exceeding 10 000, denoting the sizes of sheets.

Output

Print a single line containing one integer denoting the minimum number of stacks that can be obtained from stacking up all of the sheets using the rules described above.

Examples

standard input	standard output
4 10 10 5 5 9 3 1 7	2

Problem 6. Tree rings

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

Scientists often use width of tree rings (the difference between the outer and the inner radius of the ring) to study a history of climatic conditions. To avoid cutting trees, a micro-drill was invented. This micro-drill goes all the way through a tree trunk and measures distances between two consecutive intersections with the borders of the rings. If the micro-drill was tangent to a ring border, it does not count as an intersection. However, the results of the measurement do not always agree with the actual ring widths because the micro-drill may not go through the center of the trunk. Given the results of the measurement and the diameter of the tree, find out the real radius of the circles that are the boundaries of the tree rings. Obviously, it can only be done for the boundaries crossed by the micro-drill.

Assume that all of the tree rings are perfectly circular and concentric and the path of the micro-drill is orthogonal to the axis of the tree.

Input

The first line contains an odd integer N ($3 \le N < 2000$) denoting a number of measurements of distance between ring boundaries made by the micro-drill, and an integer D ($1 \le D \le 20\ 000$) denoting the diameter of the tree, that are separated by space.

The second line contains N space-separated positive integers denoting the micro-drill measurements in mm. It is guaranteed that the first integer is equal to the last one, the second integer is equal to the second to last one, etc., and that the sum of all measurements does not exceed the diameter of the tree.

Output

Print a single line containing $\frac{N-1}{2}$ space-separated real numbers in a fixed-point format with 3 digits after the decimal point denoting radiuses of the circles that are the boundaries of the tree rings sorted in descending order and excluding the radius of the tree.

Examples

standard input	standard output
3 6 2 2 2	1.000

Problem 7. Problem from a school book

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

Two tubes fill the pool in N seconds. The first tube fills the pool in M, $M > N$, seconds. How long does it take the second tube to fill the pool?

Input

A single line contains two positive integers N and M separated by space. N denotes how long does it take the two tubes to fill the pool and M denotes how long does it take the first tube to fill the pool, $1 \le N < M \le 10^7$.

Output

Print a single line containing an irreducible fraction (i.e. two positive integers, numerator and denominator, separated by the "/" character) denoting how long does it take the second tube to fill the pool. If the answer is an integer, print a fraction where the denominator is 1.

Examples

standard input	standard output
2 3	6/1

Problem 8. Matrix

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

Consider a game which state is completely defined by a square integer matrix at every step. At the next step, one row and one column are removed from the matrix. Thus, the size of the matrix is decreased by 1. Given the matrix of the game, find the number of distinct states that are possible at the next step.

Input

The first line contains an integer N, $2 \le N \le 100$, denoting the size of the matrix that defines the state of the game at some step.

After that, N lines follow. Each line contains N space-separated integers describing the values of the respective row of the matrix. All of the elements of the matrix are in the range of 0 to 100 inclusive.

Output

Print a single line containing an integer denoting the number of distinct states that are possible at the next step, i.e. after removing one row and one column.

Examples

standard input	standard output
4 1 1 2 3 1 1 2 3 2 2 2 3 3 3 3 4	9

Problem 9. Panic

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

A line of N monsters is moving towards you. The bravery of each monster is measured by a positive number. You have only two shots left, each of them can kill any monster. Of course, two dead monsters may not be enough for your rescue, so you will need to spread panic among them. The monster panics when it sees a dead monster with greater bravery than his own at any distance both to the left and to the right. If there are no non-panicking monsters among the monsters standing between two dead ones, all of these monsters will die of fear. Determine the maximum number of monsters that can be destroyed by two shots.

Input

The first line contains one positive integer N, $2 \le N \le 100\ 000$, denoting the number of monsters in the line.

The second line contains N space-separated positive integers denoting the bravery of each monster in the line from left to right. The bravery of each monster does not exceed 10 000.

Output

Print a single line containing an integer denoting the maximum number of monsters that can be destroyed by two shots.

Examples

standard input	standard output
10 5 1 8 1 7 2 2 5 6 7	6

Problem 10. Tea party in a skyscraper

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

A group of people is living in a skyscraper. They decided to meet at the flat belonging to one of them to drink tea and chat. Assume that the distance between two people is the absolute difference between the numbers of the floors on which they live. Determine a person from the group for which a sum of distances between that person and other members of the group is minimal.

Input

The first line contains a positive integer N, $1 < N \leq 10^5$, denoting the number of people in the group. The second line contains N space-separated positive integers that does not exceed 10^6 in absolute value. The first number in the line denotes the floor which the first person lives on, the second number denotes the floor which the second person lives on, etc.

Output

Print a single line containing a positive integer denoting the ordinal number of the person for which a sum of distances between that person and other members of the group is minimal. If several numbers meet the requirement, print the smallest of them.

Examples

standard input	standard output
10 0 1 2 3 4 5 6 7 8 9	5

Problem 11. Numerical lock

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

Ocean, the hero of the famous film series, is going to rob a bank. He found out that the bank vault has a new type of a safe lock. The lock seems very simple and has the form of two rings with N divisions on each of them equally-spaced on a circle. Each division on the rings has a number written near it. The inner ring can be rotated clockwise, the outer is fixed. To open the safe you need to turn the inner ring so that the sum of squared differences of numbers relating to matching divisions on the inner and the outer ring was the minimum possible. Ocean asks you to help him find the number of divisions by which he will need to rotate the inner ring clockwise to open the lock.

Input

The first line contains one positive integer N, $1 < N \le 10^5$, denoting the number of divisions on each ring.

Each of the following two lines contains N integers denoting the numbers relating to divisions on the outer and the inner ring, respectively, in a clockwise direction. All integers do not exceed 10^4. Integers with the same ordinal position in these lines relate to matching divisions in the initial position of the rings.

Output

On a single line print one non-negative integer denoting the minimum required number of divisions by which one should rotate the inner ring clockwise to open the lock.

Examples

standard input	standard output
4 1 2 3 4 2 3 4 1	1

Problem 12. Habitat

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

Eagles are big carnivores relying on their sight during hunting. To observe all of the ravine, they sit on a ridge, and the higher the eagle sits, the bigger his chances of success are.

The ridge is represented as a sequence of N peaks residing on a straight line, all heights of the peaks are different. Eagles arrive one at time and pick the highest free peak from those that have K free peaks to the left and to the right.

Find the maximum number of eagles that can reside at the ridge and determine their positions.

Input

The first line contains two space-separated integers N and K ($1 \le N, K \le 10^5$).

The second line contains N different space-separated positive integers denoting the heights of the peaks in the order the peaks are located on the ridge. The heights do not exceed 10^6.

Output

On the first line, print an integer M denoting the number of eagles that can reside at the ridge. On the second line, print M integers denoting the sequence of peak indices in the descending order of peak height. Indices are 1-based.

Examples

standard input	standard output
5 2 1 2 3 7 4	2 4 1