Problem 1: Reordering the Cows

Farmer John's N cows (1 <= N <= 100), conveniently numbered 1..N, are
standing in a row.  Their ordering is described by an array A, where A(i)
is the number of the cow in position i.  Farmer John wants to rearrange
them into a different ordering for a group photo, described by an array B,
where B(i) is the number of the cow that should end up in position i.

For example, suppose the cows start out ordered as follows:

A = 5 1 4 2 3

and suppose Farmer John would like them instead to be ordered like this:

B = 2 5 3 1 4

To re-arrange themselves from the "A" ordering to the "B" ordering, the
cows perform a number of "cyclic" shifts.  Each of these cyclic shifts
begins with a cow moving to her proper location in the "B" ordering,
displacing another cow, who then moves to her proper location, displacing
another cow, and so on, until eventually a cow ends up in the position
initially occupied by the first cow on the cycle.  For example, in the
ordering above, if we start a cycle with cow 5, then cow 5 would move to
position 2, displacing cow 1, who moves to position 4, displacing cow 2,
who moves to position 1, ending the cycle.  The cows keep performing cyclic
shifts until every cow eventually ends up in her proper location in the "B"
ordering.  Observe that each cow participates in exactly one cyclic shift,
unless she occupies the same position in the "A" and "B" orderings.

Please compute the number of different cyclic shifts, as well as the length
of the longest cyclic shift, as the cows rearrange themselves.

PROBLEM NAME: reorder

INPUT FORMAT:

* Line 1: The integer N.

* Lines 2..1+N: Line i+1 contains the integer A(i).

* Lines 2+N..1+2N: Line 1+N+i contains the integer B(i).

SAMPLE INPUT:

5
5
1
4
2
3
2
5
3
1
4

OUTPUT FORMAT:

* Line 1: Two space-separated integers, the first giving the number of
        cyclic shifts and the second giving the number cows involved
        in the longest such shift.  If there are no cyclic shifts,
        output -1 for the second number.

SAMPLE OUTPUT:

2 3

OUTPUT DETAILS:

There are two cyclic shifts, one involving cows 5, 1, and 2, and the other
involving cows 3 and 4.

Problem 2: Cow Art

A little known fact about cows is the fact that they are red-green
colorblind, meaning that red and green look identical to them.  This makes
it especially difficult to design artwork that is appealing to cows as well
as humans.

Consider a square painting that is described by an N x N grid of characters
(1 <= N <= 100), each one either R (red), G (green), or B (blue).  A
painting is interesting if it has many colored "regions" that can
be distinguished from each-other.  Two characters belong to the same
region if they are directly adjacent (east, west, north, or south), and
if they are indistinguishable in color.  For example, the painting

RRRBB
GGBBB
BBBRR
BBRRR
RRRRR

has 4 regions (2 red, 1 blue, and 1 green) if viewed by a human, but only 3
regions (2 red-green, 1 blue) if viewed by a cow.

Given a painting as input, please help compute the number of regions in the
painting when viewed by a human and by a cow.

PROBLEM NAME: cowart

INPUT FORMAT:

* Line 1: The integer N.

* Lines 2..1+N: Each line contains a string with N characters,
      describing one row of a painting.

SAMPLE INPUT:

5
RRRBB
GGBBB
BBBRR

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BBRRR
RRRRR
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OUTPUT FORMAT:

* Line 1: Two space-separated integers, telling the number of regions
          in the painting when viewed by a human and by a cow.

SAMPLE OUTPUT:

4 3

Problem 3: Watering the Fields

Due to a lack of rain, Farmer John wants to build an irrigation system to send water between his N fields (1 <= N <= 2000).

Each field i is described by a distinct point (xi, yi) in the 2D plane, with 0 <= xi, yi <= 1000.  The cost of building a water pipe between two fields i and j is equal to the squared Euclidean distance between them:

(xi - xj)^2 + (yi - yj)^2

FJ would like to build a minimum-cost system of pipes so that all of his fields are linked together -- so that water in any field can follow a sequence of pipes to reach any other field.

Unfortunately, the contractor who is helping FJ install his irrigation system refuses to install any pipe unless its cost (squared Euclidean length) is at least C (1 <= C <= 1,000,000).

Please help FJ compute the minimum amount he will need pay to connect all his fields with a network of pipes.

PROBLEM NAME: irrigation

INPUT FORMAT:

* Line 1: The integers N and C.

* Lines 2..1+N: Line i+1 contains the integers xi and yi.

SAMPLE INPUT:

3 11
0 2
5 0
4 3

INPUT DETAILS:

There are 3 fields, at locations (0,2), (5,0), and (4,3).  The contractor will only install pipes of cost at least 11.

OUTPUT FORMAT:

* Line 1: The minimum cost of a network of pipes connecting the
       fields, or -1 if no such network can be built.

SAMPLE OUTPUT:

46

OUTPUT DETAILS:

FJ cannot build a pipe between the fields at (4,3) and (5,0), since its
cost would be only 10.  He therefore builds a pipe between (0,2) and (5,0)
at cost 29, and a pipe between (0,2) and (4,3) at cost 17.

Problem 4: The Lazy Cow

It's a hot summer day, and Bessie the cow is feeling quite lazy.  She wants
to locate herself at a position in her field so that she can reach as much
delicious grass as possible within only a short distance.

There are N patches of grass (1 <= N <= 100,000) in Bessie's field.
The ith such patch contains $g_i$ units of grass (1 <= $g_i$ <= 10,000)
and is located at a distinct point ($x_i$, $y_i$) in the field (0 <= $x_i$,
$y_i$ <= 1,000,000).  Bessie would like to choose a point in the field
as her initial location (possibly the same point as a patch of grass,
and possibly even a point with non-integer coordinates) so that a
maximum amount of grass is within a distance of K steps from this
location (1 <= K <= 2,000,000).

When Bessie takes a step, she moves 1 unit north, south, east, or west of
her current position.  For example, to move from (0,0) to (3,2), this
requires 5 total steps.  Bessie does not need to take integer-sized
steps -- for example, 1 total step could be divided up as half a unit
north and half a unit east.

Please help Bessie determine the maximum amount of grass she can reach, if
she chooses the best possible initial location.

PROBLEM NAME: lazy

INPUT FORMAT:

* Line 1: The integers N and K.

* Lines 2..1+N: Line i+1 describes the ith patch of grass using 3
        integers: $g_i$, $x_i$, $y_i$.

SAMPLE INPUT:

4 3
7 8 6
3 0 0
4 6 0
1 4 2

INPUT DETAILS:

Bessie is willing to take at most 3 steps from her initial position.  There
are 4 patches of grass.  The first contains 7 units of grass and is located
at position (8,6), and so on.

OUTPUT FORMAT:

* Line 1: The maximum amount of grass Bessie can reach within K steps,
          if she locates herself at the best possible initial position.

SAMPLE OUTPUT:

8

OUTPUT DETAILS:

By locating herself at (3,0), the grass at positions (0,0), (6,0), and
(4,2) is all within K units of distance.

Problem 5: Sabotage

Farmer John's arch-nemesis, Farmer Paul, has decided to sabotage Farmer John's milking equipment!

The milking equipment consists of a row of N (3 <= N <= 100,000) milking machines, where the ith machine produces M_i units of milk (1 <= M_i <= 10,000).  Farmer Paul plans to disconnect a contiguous block of these machines -- from the ith machine up to the jth machine (2 <= i <= j <= N-1); note that Farmer Paul does not want to disconnect either the first or the last machine, since this will make his plot too easy to discover.  Farmer Paul's goal is to minimize the average milk production of the remaining machines.  Farmer Paul plans to remove at least 1 cow, even if it would be better for him to avoid sabotage entirely.

Fortunately, Farmer John has learned of Farmer Paul's evil plot, and he is wondering how bad his milk production will suffer if the plot succeeds.  Please help Farmer John figure out the minimum average milk production of the remaining machines if Farmer Paul does succeed.

PROBLEM NAME: sabotage

INPUT FORMAT:

* Line 1: The integer N.

* Lines 2..1+N: Line i+1 contains M_i.

SAMPLE INPUT:

5
5
1
7
8
2

OUTPUT FORMAT:

* Line 1: The lowest possible average Farmer Paul can achieve, rounded

to 3 digits after the decimal point, and printed with 3 digits after the decimal point.

SAMPLE OUTPUT:

2.667

OUTPUT DETAILS:

The optimal solution is to remove the 7 and 8, leaving 5, 1, and 2, whose average is 8/3.