Cow Race

In order to finally settle their long-running dispute over who is the faster cow, Bessie and her friend Elsie decide to hold a race across the farm.

The two cows start at the same location and begin running in the same direction at the same time. The progress of each cow is described by a series of "segments", during each of which the cow runs at a constant speed. For example, Bessie might run at a speed of 5 for 3 units of time, then at a speed of 10 for 6 units of time. Bessie and Elsie both run for the same total amount of time.

The cows would like your help in counting the number of leadership changes during their race. A leadership change happens at a point in time when cow A pulls into the lead of cow B, whereas the last time one cow was in the lead, it was cow B. For example, if B is in the lead and then A pulls ahead, then this is a leadership change. If B is in the lead, and then A becomes even with B for some time and then finally pulls ahead, then this also counts as a leadership change.

INPUT FORMAT:

* Line 1: Two space-separated integers, N and M. (1 <= N, M <= 1000)
* Lines 2..1+N: Each line contains one of the N segments of Bessie's run, described by two integers: Bessie's speed and the amount of time she runs at that speed (both integers are in the range 1..1000).
* Lines 2+N..1+N+M: Each line contains one of the M segments of Elsie's run, described by two integers: Elsie's speed and the amount of time she runs at that speed (both integers are in the range 1..1000).

SAMPLE INPUT:

```
4 3
1 2
4 1
1 1
2 10
2 3
1 2
3 9
```

INPUT DETAILS:

Bessie runs at a speed of 1 for 2 units of time, then at a speed of 4 for 1 unit of time, then at a speed of 1 for 1 unit of time, and finally at a speed of 2 for 10 units of time. Elsie runs at a speed of 2 for 3 units of time, then at a speed of 1 for 2 units of time, then finally at a speed of 3 for 9 units of time.

Note that both cows run for a total of 14 units of time.

OUTPUT FORMAT:
* Line 1: The number of leadership changes during the race.

SAMPLE OUTPUT:
2

OUTPUT DETAILS:
Elsie is ahead until time t=3, when both cows meet after both have traveled 6 units of total distance and travel together for 1 unit of time. Bessie then pulls ahead briefly (the first leadership change), only to be overtaken shortly thereafter by Elsie (the second leadership change). Elsie ends the race in the lead.

Breed Proximity

Farmer John's N cows (1 <= N <= 50,000) are standing in a line, each described by an integer breed ID.

Cows of the same breed are at risk for getting into an argument with each-other if they are standing too close. Specifically, two cows of the same breed are said to be "crowded" if their positions within the line differ by no more than K (1 <= K < N).

Please compute the maximum breed ID of a pair of crowded cows.

INPUT FORMAT:

* Line 1: Two space-separated integers: N and K.
* Lines 2..1+N: Each line contains the breed ID of a single cow in the line. All breed IDs are integers in the range 0..1,000,000.

SAMPLE INPUT:

```
6 3
7
3
4
2
3
4
```

INPUT DETAILS:

There are 6 cows standing in a line, with breed IDs 7, 3, 4, 2, 3, and 4. Two cows of equal breed IDs are considered crowded if their positions differ by at most 3.

OUTPUT FORMAT:

* Line 1: The maximum breed ID of a crowded pair of cows, or -1 if there is no crowded pair of cows.

SAMPLE OUTPUT:

```
4
```

OUTPUT DETAILS:

The pair of cows with breed ID 3 is crowded, as is the pair of cows with breed ID 4.

Poker Hands

Bessie and her friends are playing a unique version of poker involving a deck with N (1 <= N <= 100,000) different ranks, conveniently numbered 1..N (a normal deck has N = 13). In this game, there is only one type of hand the cows can play: one may choose a card labeled i and a card labeled j and play one card of every value from i to j. This type of hand is called a "straight".

Bessie's hand currently holds a_i cards of rank i (0 <= a_i <= 100000). Help her find the minimum number of hands she must play to get rid of all her cards.

INPUT FORMAT:

* Line 1: The integer N.
* Lines 2..1+N: Line i+1 contains the value of a_i.

SAMPLE INPUT:

```
5
2
4
1
2
3
```

OUTPUT FORMAT:

* Line 1: The minimum number of straights Bessie must play to get rid
  of all her cards.

SAMPLE OUTPUT:

```
6
```

OUTPUT DETAILS:

Bessie can play a straight from 1 to 5, a straight from 1 to 2, a straight from 4 to 5, two straights from 2 to 2, and a straight from 5 to 5, for a total of 6 rounds necessary to get rid of all her cards.

The Cow Run

Farmer John has forgotten to repair a hole in the fence on his farm, and his N cows (1 <= N <= 1,000) have escaped and gone on a rampage! Each minute a cow is outside the fence, she causes one dollar worth of damage. FJ must visit each cow to install a halter that will calm the cow and stop the damage.

Fortunately, the cows are positioned at distinct locations along a straight line on a road outside the farm. FJ knows the location P_i of each cow i (-500,000 <= P_i <= 500,000, P_i != 0) relative to the gate (position 0) where FJ starts.

FJ moves at one unit of distance per minute and can install a halter instantly. Please determine the order that FJ should visit the cows so he can minimize the total cost of the damage; you should compute the minimum total damage cost in this case.

INPUT FORMAT:

* Line 1: The number of cows, N.
* Lines 2..N+1: Line i+1 contains the integer P_i.

SAMPLE INPUT:

```
4
-2
-12
3
7
```

INPUT DETAILS:

Four cows placed in positions: -2, -12, 3, and 7.

OUTPUT FORMAT:

* Line 1: The minimum total cost of the damage.

SAMPLE OUTPUT:

```
50
```

OUTPUT DETAILS:

The optimal visit order is -2, 3, 7, -12. FJ arrives at position -2 in 2 minutes for a total of 2 dollars in damage for that cow.

He then travels to position 3 (distance: 5) where the cumulative damage is 2 + 5 = 7 dollars for that cow.

He spends 4 more minutes to get to 7 at a cost of 7 + 4 = 11 dollars for that cow.

Finally, he spends 19 minutes to go to -12 with a cost of 11 + 19 = 30 dollars.

The total damage is 2 + 7 + 11 + 30 = 50 dollars.

Hill Walk

There are N hills (1 <= N <= 100,000). Each hill takes the form of a line segment from (x1, y1) to (x2, y2) where x1 < x2 and y1 < y2. None of these segments intersect or touch, even at their endpoints, and furthermore, the first hill satisfies (x1, y1) = (0,0).

Bessie the cow starts at (0,0) on the first hill. Whenever Bessie is on a hill, she climbs up until she reaches the end. Then she jumps off the edge. If she lands on another hill, she continues walking on that hill; otherwise, she falls very far until she lands safely on a cushion of pillows at y = -infinity. Each hill (x1, y1) -> (x2, y2) should be regarded as containing the point (x1, y1) but not containing the point (x2, y2), so that Bessie will land on the hill if she falls on it from above at a position with x = x1, but she will not land on the hill if she falls on it from above at x = x2.

Please count the total number of hills that Bessie touches at some point during her walk.

INPUT FORMAT:

* Line 1: The number of hills, N.
* Lines 2..1+N: Line i+1 contains four integers (x1,y1,x2,y2)
  describing hill i. Each integer is in the range
  0..1,000,000,000.

SAMPLE INPUT:

```
4
0 0 5 6
1 0 2 1
7 2 8 5
3 0 7 7
```

INPUT DETAILS:

There are four hills. The first hill runs from (0,0) to (5,6), and so on.

OUTPUT FORMAT:

* Line 1: The number of hills Bessie touches on her journey.

SAMPLE OUTPUT:

```
3
```

OUTPUT DETAILS:

Bessie walks on hills #1, #4, and finally #3.