Codility_

CodeCheck Report: trainingVUYAW7-CNJ

Test Name:

Check out Codility training tasks

Summary Timeline

Tasks summary

Task	Time spent	Score
Flags C# ⚠	3 min	100%

Total score

100%

Tasks Details

Medium

1. Flags

Find the maximum number of flags that can be set on mountain peaks.

Task Score	Correctness	Performance
100%	100%	100%

Task description

A non-empty array A consisting of N integers is given.

A *peak* is an array element which is larger than its neighbours. More precisely, it is an index P such that 0 < P < N − 1 and A[P − 1] < A[P] > A[P + 1].

For example, the following array A:

```
    A[0] = 1
    A[1] = 5
    A[2] = 3
    A[3] = 4
    A[4] = 3
    A[5] = 4
    A[6] = 1
    A[7] = 2
    A[8] = 3
    A[9] = 4
    A[10] = 6
    A[11] = 2
```

Solution

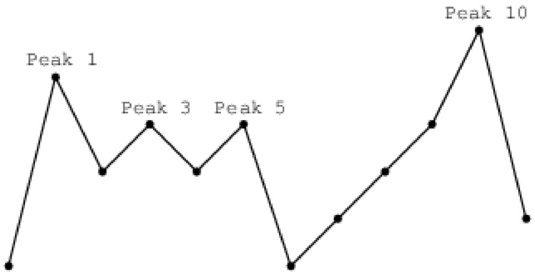
Programming language used:	C#
Total time used:	3 minutes ?
Effective time used:	3 minutes ?
Notes:	*not defined yet*

Task timeline ?

00:14:42 00:17:20

has exactly four peaks: elements 1, 3, 5 and 10.

You are going on a trip to a range of mountains whose relative heights are represented by array A, as shown in a figure below. You have to choose how many flags you should take with you. The goal is to set the maximum number of flags on the peaks, according to certain rules.



Flags can only be set on peaks. What's more, if you take K flags, then the distance between any two flags should be greater than or equal to K. The distance between indices P and Q is the absolute value |P − Q|.

For example, given the mountain range represented by array A, above, with N = 12, if you take:

- two flags, you can set them on peaks 1 and 5;
- three flags, you can set them on peaks 1, 5 and 10;
- four flags, you can set only three flags, on peaks 1, 5 and 10.

You can therefore set a maximum of three flags in this case.

Write a function:

```
class Solution { public int solution(int[] A); }
```

that, given a non-empty array A of N integers, returns the maximum number of flags that can be set on the peaks of the array.

For example, the following array A:

```
A[0] = 1
A[1] = 5
A[2] = 3
A[3] = 4
A[4] = 3
A[5] = 4
A[6] = 1
A[7] = 2
A[8] = 3
A[9] = 4
A[10] = 6
A[11] = 2
```

the function should return 3, as explained above.

Write an **efficient** algorithm for the following assumptions:

- N is an integer within the range [1..400,000];
- each element of array A is an integer within the range [0..1,000,000,000].

Code: 00:17:20 UTC, cs, final, score: 100 show code in pop-up

```
using System;
using System.Collections.Generic;

/**
 * 10.3 - Flags
 * Paulo Santos
 * 15.Dec.2022
 */
class Solution {
    public int solution(int[] A) {

        /*
         * List all the peakes
         */
        var len = A.Length;
        var peaks = new int[len];
        var cnt = 0;
        for (var i = len - 2; i > 0; i--) {
            if ((A[i - 1] < A[i]) && (A[i] > A[i +
                peaks[i] = i;
                cnt += 1;
            }
            else
                peaks[i] = peaks[i + 1];
        }

        /*
         * Plant the flags
         */
        for (var flags = peaks.Length - 1; flags >
            var planted = 0;
            var i = 1;
            while ((i < len) &&
                   (peaks[i] != 0) &&
                   (planted < flags)) {
                i = peaks[i];
                planted += 1;
                i += flags;
            }
            if (flags == planted)
                return planted;
        }

        return 0;
    }
}
```

Analysis summary

The solution obtained perfect score.

Analysis

Detected time complexity: **O(N)**

expand all	Example tests	
▶	example example test	✓ OK

expand all	Correctness tests

▶	single extreme min test	✓ OK
▶	triple three elements	✓ OK
▶	extreme_without_peaks test without peaks	✓ OK
▶	simple1 first simple test	✓ OK
▶	simple2 second simple test	✓ OK
▶	medium_many_peaks medium test with 100 peaks	✓ OK
▶	medium_random chaotic medium sequences, length = ~10,000	✓ OK
▶	packed_peaks possible to set floor(sqrt(N))+1 flags	✓ OK
expand all	**Performance tests**	
▶	large_random chaotic large sequences, length = ~100,000	✓ OK
▶	large_little_peaks large test with 20-800 peaks	✓ OK
▶	large_many_peaks large test with 10,000 - 25,000 peaks	✓ OK
▶	large_anti_slow large test anti slow solutions	✓ OK
▶	large_anti_slow2 large test anti slow solutions	✓ OK
▶	extreme_max extreme test, maximal number of elements	✓ OK
▶	extreme_max2 extreme test, maximal number of elements	✓ OK