Open Feedback Dialog

cod1l1ty

Demo ticket

Session

ID: demoVFJ264-KBQ
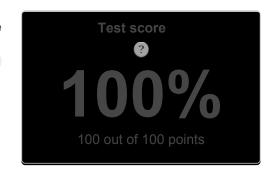**Time limit:** 120 min.

Status: closed

Created on: 2014-03-22 19:00 UTC
Started on: 2014-03-22 19:00 UTC
Finished on: 2014-03-22 19:00 UTC

Tasks in test

1 | {} Equi

Task score

100%

Test score

❓

100%

100 out of 100 points

MEDIUM

1. Equi
Find an index in an array such that its prefix sum equals its suffix sum.

score: 100 of 100

Task description

This is a demo task. You can read about this task and its solutions in this blog post.
A zero-indexed array A consisting of N integers is given. An *equilibrium index* of this array is any integer P such that 0 ≤ P < N and the sum of elements of lower indices is equal to the sum of elements of higher indices, i.e.

$A[0] + A[1] + ... + A[P-1] = A[P+1] + ... + A[N-2] + A[N-1]$.

Sum of zero elements is assumed to be equal to 0. This can happen if P = 0 or if P = N−1.
For example, consider the following array A consisting of N = 7 elements:

```
A[0] = -7   A[1] =  1   A[2] = 5
A[3] =  2   A[4] = -4   A[5] = 3

A[6] =  0
```

P = 3 is an equilibrium index of this array, because:

- $A[0] + A[1] + A[2] = A[4] + A[5] + A[6]$

P = 6 is also an equilibrium index, because:

- $A[0] + A[1] + A[2] + A[3] + A[4] + A[5] = 0$

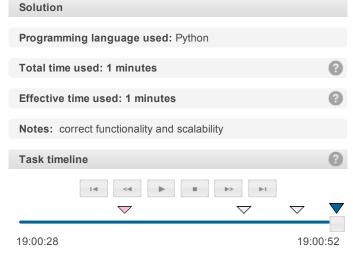and there are no elements with indices greater than 6.
P = 7 is not an equilibrium index, because it does not fulfill the condition 0 ≤ P < N.
Write a function

```
def solution(A)
```

that, given a zero-indexed array A consisting of N integers, returns any of its equilibrium indices. The function should return −1 if no equilibrium index exists.
Assume that:

- N is an integer within the range [0..10,000,000];
- each element of array A is an integer within the range [−2,147,483,648..2,147,483,647].

Solution

Programming language used: Python

Total time used: 1 minutes ❓

Effective time used: 1 minutes ❓

Notes: correct functionality and scalability

Task timeline ❓

|◀ ◀◀ ▶ ■ ▶▶ ▶|

19:00:28   19:00:52

Code: 19:00:52 UTC, py, final, score: **100.00**

```
01. def solution(A):
02.     N = len(A)
03.     if N == 0: return -1
04.     if N == 1: return 0
05.
06.     prefix = [0] * N
07.     prefix[0] = A[0]
08.     for i in xrange(1, N):
09.         prefix[i] = prefix[i-1] + A[i]
10.     suffix = [0] * N
11.     suffix[N-1] = A[N-1]
12.     for i in xrange(N-2, -1, -1):
13.         suffix[i] = suffix[i+1] + A[i]
14.
15.     for i in xrange(N):
16.         if (i == 0 and suffix[i+1] == 0) or\
17.             ( i == N -1 and prefix[i-1] == 0) or\
18.             (i != 0 and i != N-1 and suffix[i+1] ==
                 prefix[i-1]):
19.             return i
20.
21.     return -1
```

[−2,147,483,648..2,147,483,047].

For example, given array A such that

```
A[0] = -7   A[1] = 1   A[2] = 5
A[3] = 2    A[4] = -4   A[5] = 3
A[6] = 0
```

the function may return 3 or 6, as explained above.
Complexity:

- expected worst-case time complexity is O(N);
- expected worst-case space complexity is O(N), beyond input storage (not counting the storage required for input arguments).

Elements of input arrays can be modified.

Analysis

Detected time complexity:
O(N)

test	time	result
example Test from the task description	0.050 s.	OK
simple	0.050 s.	OK
extreme_large_numbers Sequence with extremly large numbers testing arithmetic overflow.	0.050 s.	OK
extreme_negative_numbers Sequence with extremly large numbers testing arithmetic overflow.	0.050 s.	OK
overflow_tests1 arithmetic overflow tests	0.050 s.	OK
overflow_tests2 arithmetic overflow tests	0.050 s.	OK
one_large one large number at the end of the sequence	0.050 s.	OK
sum_0 sequence with sum=0	0.050 s.	OK
single single number	0.050 s.	OK
empty Empty array	0.050 s.	OK
combinations_of_two multiple runs, all combinations of {-1,0,1}^2	0.050 s.	OK
combinations_of_three multiple runs, all combinations of {-1,0,1}^3	0.050 s.	OK
small_pyramid	0.050 s.	OK
large_long_sequence_of_ones	0.270 s.	OK
large_long_sequence_of_minus_ones	0.270 s.	OK
medium_pyramid	0.130 s.	OK
large_pyramid Large performance test, O(n^2) solutions should fail.	0.470 s.	OK

Training center