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[Interview Experience] [Island] Roblox OA 2023 Four Coding Questions | Summer Software Engineer | Only look at dry goods

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Four Coding questions, three Easy and one Medium, 70min; I feel that the framework of Roblox is that the first two traverse the array, the third build a system (not too difficult but need to parse string), the fourth is a bit harder, array + extra Data structures, such as Hash, Prefix Sum, etc.; the following are four complete questions:

Q1: Calculate the final value

- traverse the array once, complete the addition and subtraction in the process, and get the final value

- $O(n)$

BACK TO QUESTIONS Question 1 of 4 Submitted

① Codewriting

Imagine that you are monitoring changes to user ratings for an online platform. Each user on this platform has an overall rating (an integer between 1 and 2500) and a corresponding level. Rating levels are based the following rules:

- rating < 1000 = "beginner";
- 1000 ≤ rating < 1500 = "intermediate";
- 1500 ≤ rating < 2000 = "advanced";
- 2000 ≤ rating = "pro".

You are given an initial rating value and an array of integers changes representing changes to the rating. Your task is to calculate the final rating and return the level corresponding to that rating.

It is guaranteed that changes to the rating value will never result in it becoming less than 1 or greater than 2500.

Example

- For initial = 1500 and changes = [-100, -300, 450, 500, -500, -600], the output should be solution(initial, changes) = "beginner".

Explanation:

The rating changes as follows: 1500 -> 1400 -> 1100 -> 1550 -> 2050 -> 1550 -> 950. The final rating value of 950 is in the range of the "beginner" level.

- For initial = 1000 and changes = [100, 200, 300, 400, -500], the output should be solution(initial, changes) = "advanced".

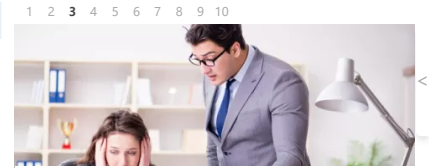
Explanation:

The rating changes as follows: 1000 -> 1100 -> 1300 -> 1600 -> 2000 -> 1500. The final rating value of 1500 is in the range of the "advanced" level.

The following content requires points higher than 188 You can already browse

Q2: The longest string

- traverse the string and find the longest continuous substrings



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- $O(n)$

[BACK TO QUESTIONS](#)[Question 2 of 4](#)

Codewriting

You are given a string `source` consisting of lowercase English letters. Your task is to find the longest contiguous `substring` consisting of the same character. If there are several substrings of the same length that meet this condition, find the rightmost one. Return a string consisting of this character concatenated with its number of occurrences in the longest contiguous substring (i.e., the length of the substring).

Example

- For `source = "bbaccodbbab"`, the output should be `solution(source) = "c3"`.

Explanation:

- There are two contiguous substrings consisting of the character `"a"`, both have a length of `1`.
- There are three contiguous substrings consisting of the character `"b"`, two have a length of `2` and one has a length of `1`.
- There is just one contiguous substring consisting of the character `"c"`, which has a length of `3`. So, this is the longest contiguous substring and hence the answer is `"c3"`.

- For `source = "bbaacaa"`, the output should be `solution(source) = "a2"`.

Explanation:

There are three different contiguous substrings with a length of `2`, so the answer should be the rightmost one — `"a2"`.

Input/Output

- [execution time limit] 4 seconds (py3)
- function `string solution(string source)`

Q3: Design a text editor

- there are three kinds of commands: INSERT, BACKSPACE, UNDO

- you can use a stack to record the previous command, and you can pop one each time UNDO

- need to process the next string, but it is not too difficult

- $O(n)$

[BACK TO QUESTIONS](#)[Question 3 of 4 Submitted](#)

Codewriting

A text editor is a type of computer program that allows users to edit plain text.

Your task is to simulate a simplified text editor which can handle three types of operations:

- `INSERT <text>` - adds `<text>` to the end of the current text, where `<text>` is a string consisting of 20 English letters at most.
- `BACKSPACE` - erases the last character of the current text. If the current text is empty, this does nothing.
- `UNDO` - undo the last successful `INSERT` or `BACKSPACE` operation. If there is nothing to undo, this does nothing.

Note:

- An operation is considered *successful* if the current text in the editor is changed by the operation. Examples of *unsuccessful* operations include a `BACKSPACE` on empty text, or an `INSERT` pasting an empty string.
- It should not be possible to undo one particular operation more than once: if the operation has been undone, it's undone forever. However, it should be possible to undo several previous operations one by one.

You are given `operations`, an array of strings which represents user inputs calling one of the operations described above. Your task is to find the resulting text after an input, and return an array where the `ith` element represents the resulting text after the `ith` input operation is performed.

Example

- For `operations = ["INSERT Code", "INSERT Signal", "BACKSPACE", "UNDO"]`, the output should be `solution(operations) = ["Code", "CodeSignal", "CodeSignal", "CodeSignal"]`.
- Initially, the text is empty.
- After `operations[0] = "INSERT Code"`, the text becomes `"Code"`.



```
solution(operations) = ["Code", "CodeSignal", "CodeSignal", "CodeSignal"] .
```

- Initially, the text is empty.
- After `operations[0] = "INSERT Code"`, the text becomes `"Code"`.
- After `operations[1] = "INSERT Signal"`, the text becomes `"CodeSignal"`.
- After `operations[2] = "BACKSPACE"`, the last character is removed, so the text becomes `"CodeSigna"`.
- After `operations[3] = "UNDO"`, the previous `BACKSPACE` operation is undone, so the text becomes `"CodeSignal"`.
- So, the output after each input operation is `["Code", "CodeSignal", "CodeSignal", "CodeSignal"]`.

• For `operations = ["INSERT co", "INSERT d", "UNDO", "BACKSPACE", "UNDO", "INSERT ding"]`, the output should be `solution(operations) = ["co", "cod", "co", "c", "co", "coding"]`.

- Initially, the text is empty.
- After `operations[0] = "INSERT co"`, the text becomes `"co"`.
- After `operations[1] = "INSERT d"`, the text becomes `"cod"`.
- After `operations[2] = "UNDO"`, the previous `INSERT` operation is undone, so the text becomes `"co"`.
- After `operations[3] = "BACKSPACE"`, the last character is removed, so the text becomes `"c"`.
- After `operations[4] = "UNDO"`, the previous `BACKSPACE` operation is undone, so the text becomes `"co"`.
- After `operations[5] = "INSERT ding"`, the text becomes `"coding"`.
- So, the output after each input operation is `["co", "cod", "co", "c", "co", "coding"]`.

Input/Output

BACK TO QUESTIONS

Question 3 of 4 Submitted

• For `operations = ["INSERT co", "INSERT d", "UNDO", "BACKSPACE", "UNDO", "INSERT ding"]`, the output should be `solution(operations) = ["co", "cod", "co", "c", "co", "coding"]`.

- Initially, the text is empty.
- After `operations[0] = "INSERT co"`, the text becomes `"co"`.
- After `operations[1] = "INSERT d"`, the text becomes `"cod"`.
- After `operations[2] = "UNDO"`, the previous `INSERT` operation is undone, so the text becomes `"co"`.
- After `operations[3] = "BACKSPACE"`, the last character is removed, so the text becomes `"c"`.
- After `operations[4] = "UNDO"`, the previous `BACKSPACE` operation is undone, so the text becomes `"co"`.
- After `operations[5] = "INSERT ding"`, the text becomes `"coding"`.
- So, the output after each input operation is `["co", "cod", "co", "c", "co", "coding"]`.

Input/Output

• [execution time limit] 4 seconds (py3)

• [input] array.string operations

A sequence of user inputs, each calling one of the operations described above. It's guaranteed that all inputs will satisfy the format of operations as described above.

Guaranteed constraints:

`1 ≤ operations.length ≤ 103`.

• [output] array.string

An array of string representing the text after each input operation.

Q4: How many intervals are covered by each point

- give some intervals, that is, the range of street lights, let each point be illuminated by how many street lights

- you can use a diff array

- or slide from left to right, the record is still open of intervals, reducing the number of open intervals each time an end point is reached

- $O(n)$



Specifically, the lamps are represented in a two-dimensional array `lamps`, where the i^{th} lamp covers the segment from `lamps[i][0]` to `lamps[i][1]`, inclusive.

Additionally, you are given a list of control points on this number line, represented by an array `points`. Your task is to find the number of lamps that illuminate each control point. Specifically, for each control point `points[j]` in the array, your task is to find the number of lamps `lamps[i]` which include this point within its covered segment - when `points[j]` lies inside the segment `[lamps[i][0], lamps[i][1]]`.

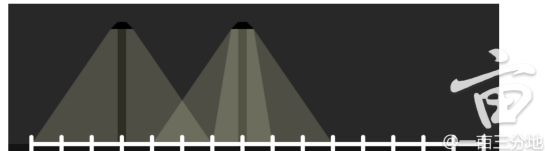
As a result, return an array of integers, where i^{th} integer corresponds to the answer for the i^{th} control point.

Example

For `lamps = [[1, 7], [5, 11], [7, 9]]` and `points = [7, 1, 5, 10, 9, 15]`, the output should be `solution(lamps, points) = [3, 1, 2, 1, 2, 0]`.

Explanation:

▼ Expand to see the example.



[BACK TO QUESTIONS](#)

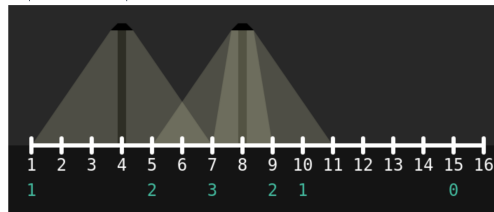
Question 4 of 4

Example

For `lamps = [[1, 7], [5, 11], [7, 9]]` and `points = [7, 1, 5, 10, 9, 15]`, the output should be `solution(lamps, points) = [3, 1, 2, 1, 2, 0]`.

Explanation:

▼ Expand to see the example.



- `point[0] = 7` is illuminated by all three lamps: 7 lies in all three segments `[1, 7]`, `[5, 11]`, and `[7, 9]`.
- `point[1] = 1` is illuminated by `lamp[0]`: 1 lies inside `[1, 7]`.
- `point[2] = 5` is illuminated by `lamp[0]` and `lamp[1]`: 5 lies inside both `[1, 7]` and `[5, 11]`.
- `point[3] = 10` is illuminated by `lamp[1]`: 10 lies inside `[5, 11]`.
- `point[4] = 9` is illuminated by `lamp[1]` and `lamp[2]`: 9 lies inside both `[5, 11]` and `[7, 9]`.
- `point[5] = 15` is not illuminated by any lamps.

[BACK TO QUESTIONS](#)

Question 4 of 4

- `point[5] = 15` is not illuminated by any lamps.

The final answer is `[3, 1, 2, 1, 2, 0]`.

Input/Output

- [execution time limit] 4 seconds (py3)

- [input] `array.array.integer lamps`

A two-dimensional array containing segments of the number line illuminated by the lamps. Each lamp is described by a two-element array.

Guaranteed constraints:

`1 ≤ lamps.length ≤ 105,`
`lamps[i].length = 2,`
`1 ≤ lamps[i][0] ≤ lamps[i][1],`
`lamps[i][0] ≤ lamps[i][1] ≤ 105.`

- [input] `array.integer points`

An array containing coordinates of control points.

Guaranteed constraints:

`1 ≤ points.length ≤ 105,`
`1 ≤ points[i] ≤ 105.`

- [output] `array.integer`

The number of lamps which illuminate each control point.

That's all four questions! It is recommended that

- the first course 3 minutes
- the second course 5 minutes
- the third course 30 minutes
- the fourth course 30 minutes



Answer to Q4

- use a diff array, add 1 to the starting point of each street light, and -1 to the end point

- and then build a res array, starting from 0, +1 every time you reach +1 in the diff array, and -1 when you reach the diff array

- In this way, the res array records how many lights hit each point~

- Time: O(n)

- Here is the C++ code

- Diff array reference can be found here: <https://www.geeksforgeeks.org/difference-array-update-query-o1/>

...

```
#include <vector>
```

```
#include <iostream>
```

```
using namespace std;
```

```
vector<int> calcLamp(vector<vector<int> >& lamps, vector<int>& points){
```

```
    int Max = 0;
```

```
    // find the max / furthest position
```

```
    for(auto&
```

```
        if(vec[1] > Max) Max = vec[1];
```

```
    }
```

```
    for(int i : points){
```

```
        if(i > Max) Max = i;
```

```
    }
```

```
    // use Max position to initialize the diff array
```

```
    vector<int> diff(Max+2, 0);
```

```
    vector<int> res(Max+2, 0);
```

```
    // diff[] is the difference array
```

```
    for(auto& vec : lamps){
```

```
        diff[vec[0]] ++;
```

```
        diff [vec[1]+1] --;
```

```
    }
```

```
    // res[] records how many lamps overlap at each position
```



```
    }

    // build the answer array
    vector<int> ans;

    for(int point : points){
        ans.push_back(res[point]);
    }

    return ans;
}

int main(){

    vector<vector<int> > lamps;

    vector<int> points = {7, 1, 5, 10, 9, 15};

    lamps.push_back({1, 7});

    lamps.push_back({5, 11});

    lamps.push_back({7, 9});

    calcLamp(lamps, points);

}
```

..

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Explanation:

The rating changes as follows: 1000 -> 1100 -> 1300 -> 1600 -> 2000 -> 1500 . The final rating value of 1500 is in the range of the "advanced" level.

Input/Output

- [execution time limit] 4 seconds (py3)

- [input] integer initial

An initial rating value.

Guaranteed constraints:

$1 \leq \text{initial} \leq 2500$.

- [input] array.integer changes

An array of integers representing rating changes.

Guaranteed constraints:

$0 \leq \text{changes.length} \leq 1000$.

$-1000 \leq \text{changes}[i] \leq 1000$.

- [output] string

The level of the final rating as described above.



score

Number of participants +37 reason put away

garimell	+ 1	thank you, owner
God of Qing Dac	+ 30	
JJEEEE	+ 1	Give you a Like!
LUDL0WS	+ 1	Give you a Like!
qwertycc123	+ 1	Very useful information!
in the evening	+ 1	Give you a Like!
Xuan Xuan Xuan	+ 1	Very useful information!
ghost2019	+ 1	Very useful information!

check all ratings

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Has been added, the landlord. Can you ask more about the idea of the fourth question? I didn't want to understand the solution with a time complexity of N. Using the method you said, don't you need to sort the lamps first, so that there will be a complexity of NlogN. Thanks!

Reply

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匿名用户-6AE 2022-8-31 21:26:21



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第四题lamps不sort的话没法sweep line吧?

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匿名用户 发表于 2022-8-27 15:03

已加米，楼主。能多问问第四题的思路吗，没有想明白时间复杂度为N的解。用你说的方法，不需要先sort一下lam ...

求问最后咋做的呀

回复

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 匿名用户-034 2022-9-7 14:31:39



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匿名用户 发表于 2022-8-27 17:03

已加米，楼主。能多问问第四题的思路吗，没有想明白时间复杂度为N的解。用你说的方法，不需要先sort一下lam ...

Q4答案已补充到帖子，谢谢留言！

回复

评分 举报

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 匿名用户-034 2022-9-7 14:32:43



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小亩_e3cf8fe 发表于 2022-9-1 02:57

最后一题可以用binary indexed tree做吧，时间复杂度是nlogn，O(n) 没想到咋做

Binary index tree 应该也可以，用 diff array 可以做到 $O(n)$ ，答案已补充~

回复

评分 举报

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 匿名用户-034 2022-9-7 14:33:57



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匿名用户 发表于 2022-8-31 23:26

第四题lamps不sort的话没法sweep line吧？

是的 sweep line 应该需要先sort，不过用 diff array 应该可以 $O(n)$ ，已补充答案~



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