



C++ STL Intermediate Problem Solving

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Problem 1

Same Differences:

<https://codeforces.com/problemset/problem/1520/D>

N


$$a = a_1 \ a_2 \ a_3 \ \dots \ a_n$$

$$(i, j)$$

$$i < j$$

$$a_j - a_i = j - i \}$$

all such
pairs?



$$\underline{\underline{2 \times 10^8 \text{ ops}}}$$

$$\Rightarrow \text{ops/testcase} = \frac{2 \times 10^8}{10^4} = \underline{\underline{2 \times 10^4}}$$

$$t_1 \Rightarrow n_1 \approx \underline{\underline{2 \times 10^5}}$$

$O(n)$ will not work
 $\rightarrow n \approx 2 \times 10^5$

1 test



10^4 test case

t_1 t_2 t_3 \dots t_{10^4}

n_1 n_2 n_3 \dots $+ n_{10^4} \leq 2 \cdot 10^5$

$$n_i \approx \frac{2 \times 10^5}{10^4} \approx 2 \times 10 = 20$$

$$1 \text{ test} = 2 \times 10^8$$

$$n \approx 10^5$$


$$O(n \log n) \checkmark$$

$$O(n) \checkmark$$

NO

TLE

}

$$\underbrace{a_j - a_i}_{\text{LHS}} = \underbrace{j - i}_{\text{RHS}}$$

$$\underbrace{a_j - j}_{\text{LHS}} = \underbrace{a_i - i}_{\text{RHS}}$$

$$\{a_x - x\} = dx$$

$$\{d_1 \ d_2 \ d_3 \ d_4 \ \dots \ d_{n-1} \ d_n\}$$

$$\begin{array}{ccccccc} \checkmark & \checkmark & & \checkmark & & \checkmark & \checkmark \\ \checkmark 3 & 3 & 4 & \checkmark 3 & 1 & 2 & 2 \\ \hline & \checkmark & & \checkmark & & & \end{array}$$

$$3 \textcircled{2} = 3 + 2 \textcircled{2} = 1 + 0 + 0 \Rightarrow \textcircled{4}$$

$$nC_2$$

↳ Combinatorics

$$\rightarrow \frac{n!}{(n-2)! 2!}$$

\Rightarrow

$$\frac{(n)(n-1)}{2}$$

\nearrow n freq

\leftarrow



Problem 2

Eating Candies:

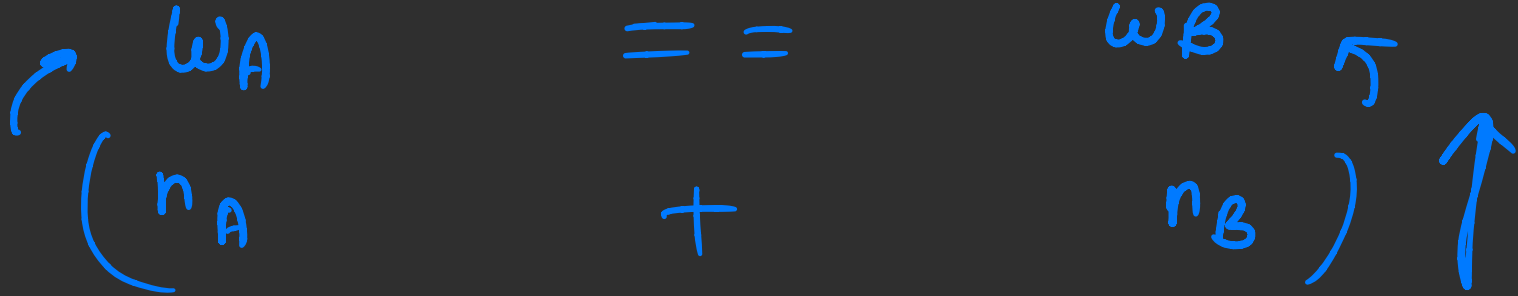
<https://codeforces.com/problemset/problem/1669/F>

Alice \rightarrow

\leftarrow Bob

$\omega_1 \quad \omega_2 \quad \omega_3 \quad \omega_4 \quad \dots \quad \omega_{n-2} \quad \omega_{n-1} \quad \omega_n$



$$\begin{array}{ccc} \omega_A & = & \omega_B \\ \uparrow & & \uparrow \\ \left(n_A \right) & + & \left(n_B \right) \end{array}$$


2 1 4

1 2 4




Alice



Bob

$$(7) = (7)$$

$$(3) + (3) = \textcircled{6}$$


$O(n \log n)$ ✓

$O(n)$ ✓

$O(n^2)$ ↑ ✗

(2 Pointer)

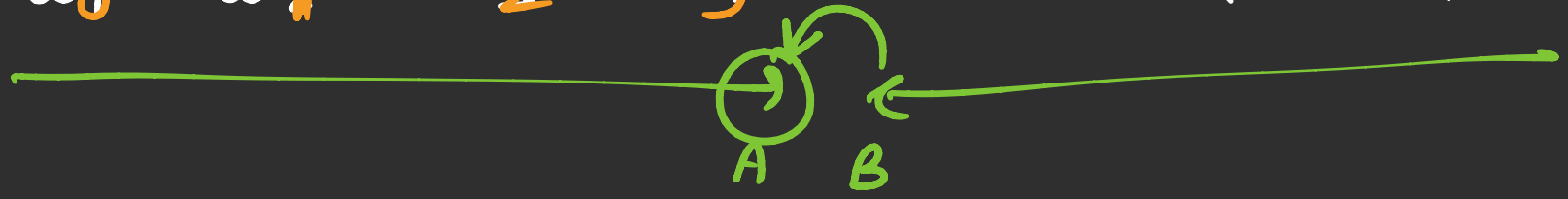
Ali

↓ ^{left}

w_0 w_1 w_2 w_3 ... w_{n-2} w_{n-1} w_n

(Bob) ↓

↑ ^{right}



↓
Stop

$$w_A = w_1$$

$$w_B = w_n + w_{n-1}$$

I $w_A == w_B \rightarrow$ Step 1
Let's note candy count
Step 2
Let's both move } ①

II $w_A > w_B \rightarrow$ Bob moves } ②

III $w_A < w_B \rightarrow$ Alice moves } ③



Problem 3

Double-ended Strings:

<https://codeforces.com/problemset/problem/1506/C>

$$a = \overbrace{a_1}^{x_1} \overbrace{a_2 a_3 a_4 a_5}^{y_1} \overbrace{a_6 \dots a_n}^{x_2}$$

$$b = \underbrace{b_1 b_2 b_3}_{x_3} \underbrace{b_4 b_5 b_6 \dots}_{y_2} \underbrace{b_n}_{x_4}$$

$$x_1 + x_2 + x_3 + x_4 = \downarrow \rightarrow \text{ans}$$

$$y_1 + y_2 = \uparrow$$

\downarrow
 LCS

\downarrow
 LCS

$$(|A| + |B| - 2 \times \text{LCS})$$



Ans

portion - substring
largest - longest
same - common

longest common substring (LCS)

DSA

Recursion + DP

$$O(|a| \times |b|)$$

$$\text{ops/testcase} = \frac{2 \times 10^8}{10^2}$$

$$\underline{20^2} \rightarrow 20^3 \rightarrow \underline{\underline{20^4}}$$

$$= \underline{\underline{2 \times 10^6}}$$

$$\left. \begin{array}{l} 16 \times 10^4 \\ \approx 1. \times 10^5 \end{array} \right\}$$



```

for(          len          ) ← n
{
  "len" ← 3
  for( a string → len ) ← n
  {
    for( b - string → len ) ← n
    {
      if( e - a == e - b ) ← len
    }
  }
}

```

$O(n^4) \Rightarrow \underline{\underline{20^4}}$