



Math For CP - Intermediate Problem Solving

- Viraj Chandra



Problem 1

Vlad and Candies:

<https://codeforces.com/contest/1660/problem/B>

$$N \quad \begin{matrix} 1 & 2 & 3 & 4 & \dots & n \end{matrix}$$

$$a = \{ a_1, a_2, a_3, a_4 \dots a_n \}$$

$$\hookrightarrow a = \{ 0, 0, 0, 0 \dots 0 \}$$

1 2 3 3 4 ↙

1 2 3 3 ↙ 3

1 2 3 ↙ 2 3

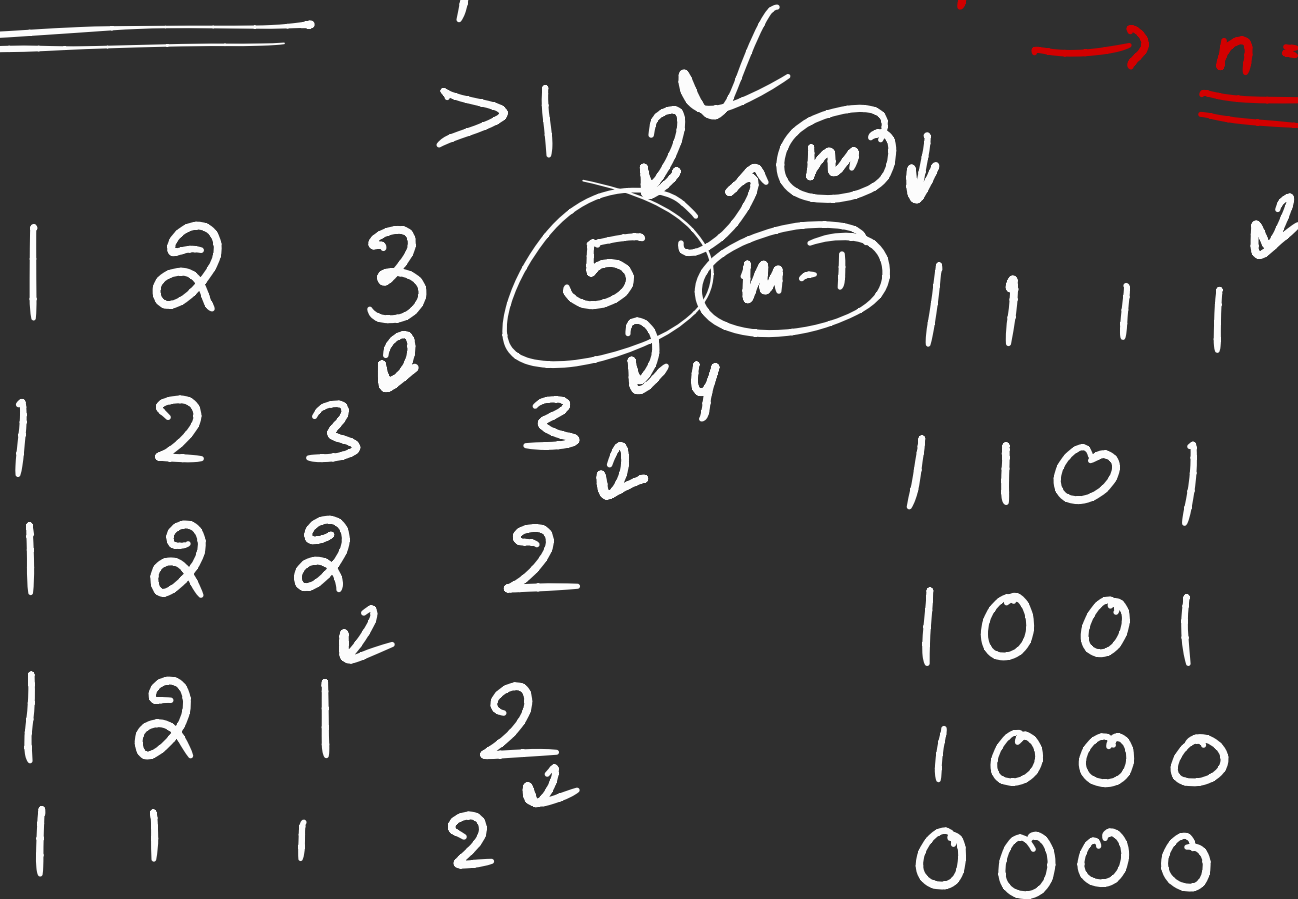
1 2 2 2 3 ↙ 2

1 2 2 2 2 (4/5)

Sort the array

Base Case

→ $n = 1$



$$\left. \begin{array}{l} n == 1 \\ a[0] == 1 \end{array} \right\} \text{YES}$$

$$d = a - b \quad (a-1)$$
$$d = a - 1 - (b - 1) = a - b$$

$$\left. \begin{array}{l} n == 1 \\ o[0] > 1 \end{array} \right\} \text{NO}$$

$$\underline{\underline{c = 1}}$$

2 4 6 ↓

2 4 5 ↓

NO



Problem 2

Longest Divisors Interval:

<https://codeforces.com/problemset/problem/1855/B>

N

$[l, r]$ size \uparrow largest

$i \rightarrow (N \% i == 0)$

$$N = 990990$$

$$\begin{matrix} \text{2} & & \text{3} \\ [9, 10, 11] \end{matrix}$$



$$\begin{aligned} \underline{\underline{990990}} \cdot \% 9 &= 0 \\ \underline{\underline{\quad}} \cdot \% 10 &= 0 \\ \underline{\underline{\quad}} \cdot \% 11 &= 0 \end{aligned} \quad \left. \vphantom{\begin{aligned} \underline{\underline{990990}} \cdot \% 9 &= 0 \\ \underline{\underline{\quad}} \cdot \% 10 &= 0 \\ \underline{\underline{\quad}} \cdot \% 11 &= 0 \end{aligned}} \right\}$$

990 990

$[9, 10, 11] \rightarrow 3$

$$\begin{array}{ccc} [s_1 & s_2 & s_3] \rightarrow 3 \\ || & || & || \\ 1 & 2 & 3 \end{array}$$

Arg =

$$[l \quad l+1 \quad l+2 \quad l+3 \quad \dots \quad r-2 \quad r-1 \quad r]$$

$$\begin{array}{cccccccc} \checkmark & \checkmark & \checkmark & \checkmark & & & & \checkmark \\ [1 & 2 & 3 & 4 & \dots & \dots & \dots & r-l+1] \end{array}$$

10^{18}

(N) ↑

1 2 3 4 5 6 7 8 9 x

↑ product → of numbers $\leq 10^{18}$

largest 'x'



Problem 3

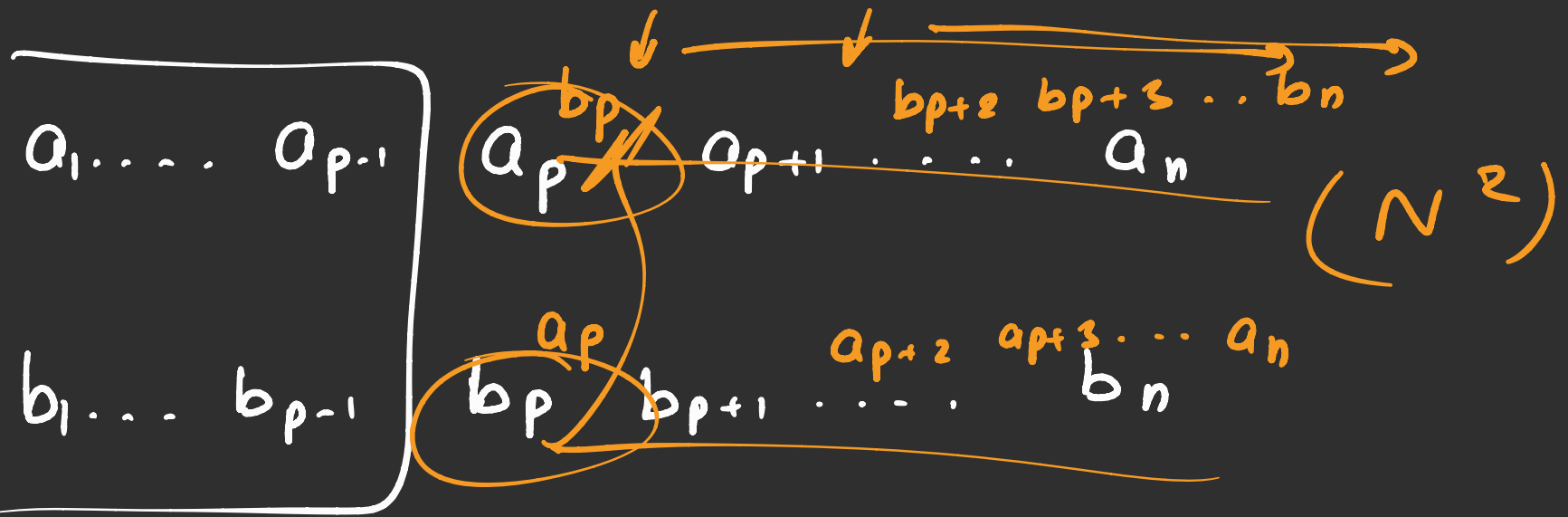
Array Balancing:

<https://codeforces.com/contest/1661/problem/A>

N

$$a = \{a_1, a_2, a_3, a_4, \dots, a_{n-1}, a_n\}$$

$$b = \{b_1, b_2, b_3, b_4, \dots, b_{n-1}, b_n\}$$



not swap

$$S + |a_p - a_{p+1}| + |b_p - b_{p+1}|$$

swap

$$S + |b_p - a_{p+1}| + |a_p - b_{p+1}|$$