



C++ Advanced Problem Solving

- Arun Kumar Singh



Problem 1

Everybody Likes Good Arrays!:

<https://codeforces.com/problemset/problem/1777/A>

Problem

given
 $(1 \leq n \leq 100)$
 $(1 \leq a[i] \leq 10^9)$

ops
delete two adj. elements with same parity and replace with their product

eg. 1

$n = 5$
 $a = [1, 7, 11, 2, 3]$

$= [7, 11, 2, 3]$

$= [77, 2, 3]$

total ops. = 2.

$a = [1, 7, 11, 2, 3]$

for 3 elements \Rightarrow 2 ops

obs \rightarrow

for K adjacent elements with same parity we need $(K-1)$ ops.

eg 2

..

Product of 2 numbers with same parity also has the same parity.
 $(3 \times 5 = 15)$
 $(2 \times 4 = 8)$

$n = 11$
 $a = [1, 1, 1, 1, 10, 12, 14, 16, 3, 2, 2]$
 $\text{total ops.} = \underbrace{3} + \underbrace{3} + \underbrace{0+1}$
 $\{ \text{total ops.} = 7 \}$

$\rightarrow a = [1, 1, 1, 1, 10, 12, 14, 16, 3, 2, 2]$

| index | K | total ops. |
|-------|---|------------|
| 0 | 1 | 0 |
| 1 | 2 | 0 |
| 2 | 3 | 0 |
| 3 | 4 | 0 |
| 4 | 1 | 0 |
| 5 | 2 | 0 |
| 6 | 3 | 0 |
| 7 | 4 | 0 |
| 8 | 1 | 0 |
| 9 | 1 | 0 |
| 10 | 2 | 0 |

$\boxed{\text{total} = 7} + 1 = 7$



Problem 2

Two Permutations:

<https://codeforces.com/problemset/problem/1761/A>

given
($1 \leq a, b \leq n \leq 100$)

Expected

if there exists two permutation with
first 'a' elements equal, and last b elements
equal.

$P[n], n=5$

↳ $\{1, 2, 3, 4, 5\}$ ✓

↳ $\{2, 3, 1, 5, 4\}$ ✓

↳ ~~$\{1, 2, 3\}$~~ $= n=3$.

$P \sim \text{length}=5$

$= \{1, 2, 3, 4, 5\}$ ✓

$= \{4, 1, 3, 5, 2\}$ ✓

~~$= \{4, 1, 1, 2, 3\}$~~ ✗

eg-1.5 $n=5, a=1, b=2$

$p = (1, 4, 5, 2, 3) \rightarrow$
 $q = (1, 5, 4, 2, 3) \rightarrow$

$(a+b \leq n-2)$

$n=5, a=2, b=2 \rightarrow \text{true}$

$p = (1, 2, 5, 3, 4)$
 $q = (1, 2, 5, 3, 4)$

① $\rightarrow [a+b = n-1] \times$

$n=5, a=3, b=2$

$p = (1, 2, 3, 4, 5)$
 $q = (1, 2, 3, 4, 5)$

$[a+b = n] \times$

$\left\{ \begin{array}{l} n=5, a=5, b=5 \\ p = (1, 2, 3, 4, 5) \\ q = (1, 2, 3, 4, 5) \end{array} \right\}$

$$(n=a=b) \checkmark$$

$$(n=a=b) \vee (a+b \leq n-2)$$

$$(a+b \leq n-2)$$

$$(a+b \leq n-1)$$

$$\hookrightarrow (a+b=n)$$

$$(a+b=n)$$

$$p = (1, 2)$$

$$q = (1, 2)$$

$$(a+b+1 < n)$$

$$\{1, 2, 3, 4, 5\}$$

$$\{1, 2, 3, 4, 5\}$$



Problem 3

Multiply by 2, Divide by 6:

<https://codeforces.com/problemset/problem/1374/B>

Given $(1 \leq n \leq 10^9)$

converts $n \rightarrow 1$

ops. \rightarrow either divide by 6 if $(n \% 6 \neq 0)$

either multiply by 2.

eg. 1
 $[n = 15]$

$\left\{ \begin{array}{c} n \\ 30 \\ 5 \\ 10 \\ 20 \\ 40 \\ \vdots \end{array} \right.$

ops.
 $\times 2$
 $\div 6$
 $\times 2$
 $\times 2$
 $\times 2$
 \vdots

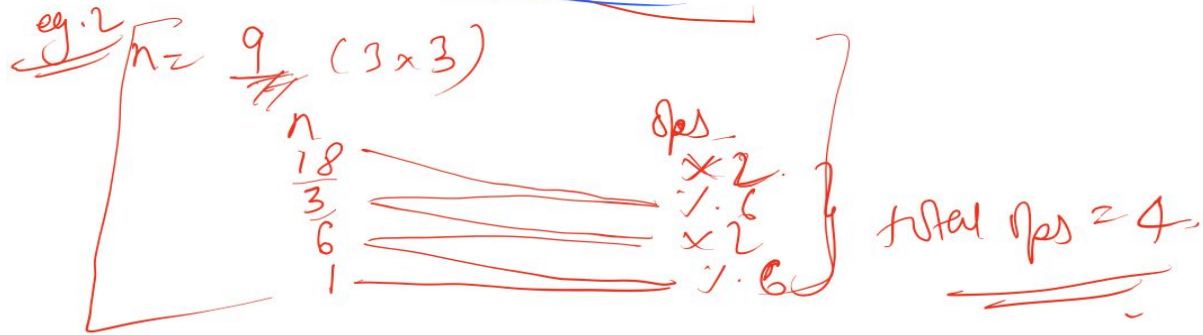
Obs:
Division should be given priority

factory
 $\hookrightarrow 2, 3, 1, 1$

\neq \times not divisible 6.
9 has 3 as a factor

$(x = 9, 27)$

{ then
 { multiplying x by 2 once makes it
 divisible by 6. }
 else { then no possible answer. }



eg 2 $n = 12$ $\div 6 = 2$

~~6x~~

{
 if $(n \% 6 == 0)$
 else $(n \times 2 \% 6 == 0)$
 else -1
 }

Q and A session