



C++ Advanced Problem Solving

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Problem 1

Everybody Likes Good Arrays!:

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

Problem

given

$$\begin{cases} 1 \leq n \leq 100 \\ 1 \leq a[i] \leq 10 \end{cases}$$

ops

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

eg. 1

$$n = 5$$
$$a = [1, \underline{7}, 11, \textcircled{2}, 3]$$

$$= [\underline{7}, 11, 2, 3]$$

$$= [\underline{\underline{7}}, \underline{2}, \underline{3}]$$

$$\text{total ops.} = 2.$$

$$a = [\underline{1}, \underline{7}, 11, 2, 3]$$

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.

$$\begin{aligned} (3 \times 5 &= 15) \\ (\cancel{2} \times \cancel{4} &= \cancel{8}) \end{aligned}$$

$n = 11$
 $a = [1, 1, 1, 1, 10, 12, 14, 16, 3, 2, 2]$
 total ops.
 $\frac{1}{3} + \frac{1}{3} + \frac{1}{6+1}$
 $\{ \text{total ops.} = 7 \}$

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

K, total ops

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	2	0
10	6	6
	+ 1	= 7
total = 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.

$$P[n], n=5$$

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

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

$$\hookrightarrow \{1, 2, \cancel{3}\} \cancel{4} = n=9,$$

$$P_2 \text{ length}=5$$

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

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

$$\leftarrow \{4, \cancel{1}, \cancel{2}, 3\} X$$

$$\text{Q-13} \quad n=5, \quad a=1, b=2.$$

$$\begin{cases} p = (1, 2, \boxed{5}, 2, 3) \\ q = (1, 2, \boxed{5, 4}, \boxed{5, 3}) \end{cases} \rightarrow \underline{a+b \leq n-2}$$

$$n=5, \quad a=2, \quad b=2 \quad \downarrow \text{true}.$$

$$\begin{cases} p = (1, 2, \boxed{5}, 2, 4) \\ q = (1, 2, \boxed{5}, 3, 4) \end{cases}$$

$$\textcircled{1} \rightarrow [a+b=n-1] \times$$

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

$$\begin{cases} p = (1, 2, 3, \boxed{4}, 5) \\ q = (1, 2, 3, \boxed{4, 5}) \end{cases}$$

$$[a+b \geq n] \times$$

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

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

$$\begin{aligned}
 & \text{Case 1: } (a = a = b) \quad \text{or} \quad (a + b \leq n - 2) \\
 & \quad \Rightarrow (a + b \leq n - 2) \\
 & \quad \Rightarrow (a + b = n) \\
 & \quad \Rightarrow (a + b = n) \\
 & \quad \Rightarrow p = \left(\begin{array}{c|c} 1 & 2 \\ 1 & 2 \end{array} \right) \quad (a + b + 1 \leq n) \\
 & \quad \Rightarrow q = \left(\begin{array}{c|c} 1 & 2 \\ 1 & 2 \end{array} \right) \\
 & \quad \Rightarrow \boxed{\{LR\} + S} \\
 & \quad \Rightarrow \boxed{\{RL\} + S}
 \end{aligned}$$



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 ($n \% 6 = 0$)

either multiply by 2.

eg. $\frac{1}{n=15}$

$$\left\{ \begin{array}{l} n \\ \boxed{30} \\ \boxed{5} \\ \hline 10 \\ 20 \\ 40 \\ ! \end{array} \right.$$

Ops { Obs.
 $\times 2$. { Division should be
 $\div 6$ given priority
 $\times 2$
 $\times 2$
 factors

 $\hookrightarrow 2, 3, 1, 1$

\Rightarrow ~~$\times 2$~~ ~~$\times 3$~~ not divisible 6.

($x=9, 27$)

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

eg. 2

$$n = \frac{9}{\cancel{3}} (3 \times 3)$$
$$\begin{array}{r} n \\ \frac{18}{3} \\ \frac{6}{1} \end{array}$$

Ops

$$\left. \begin{array}{l} \times 2 \\ \times 2 \\ \times 2 \end{array} \right\} \quad \text{Total Ops} = 4$$

eg - $n = 12 \quad \cancel{x} \cdot 6 = 2$

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

Q and A session