

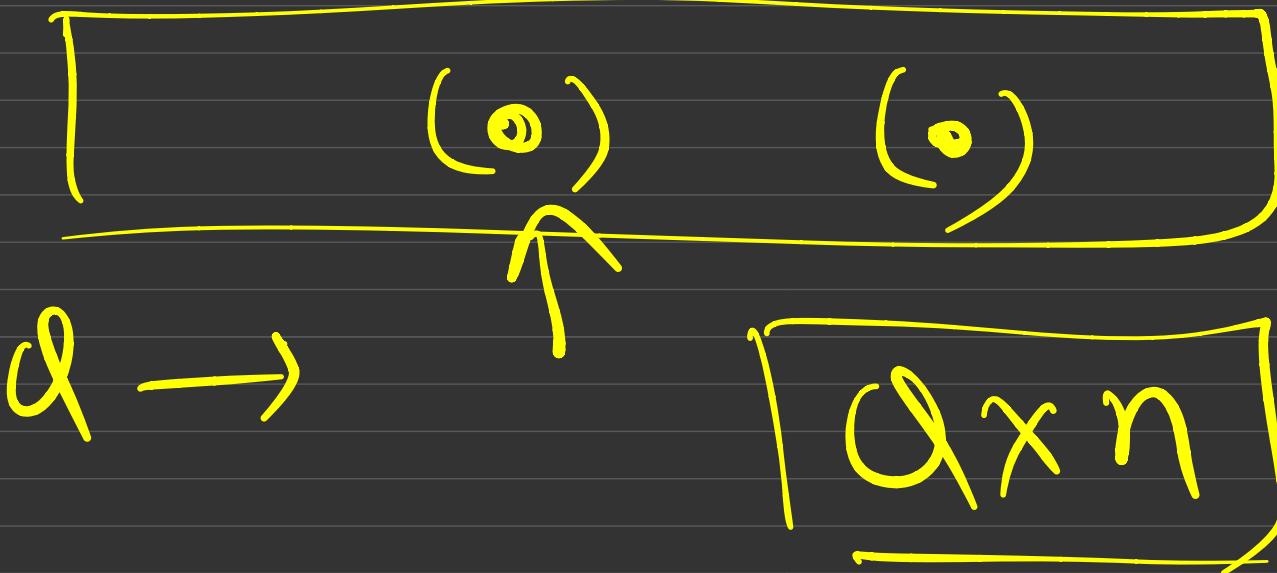
Interactive



prefix sums



The array doesn't change



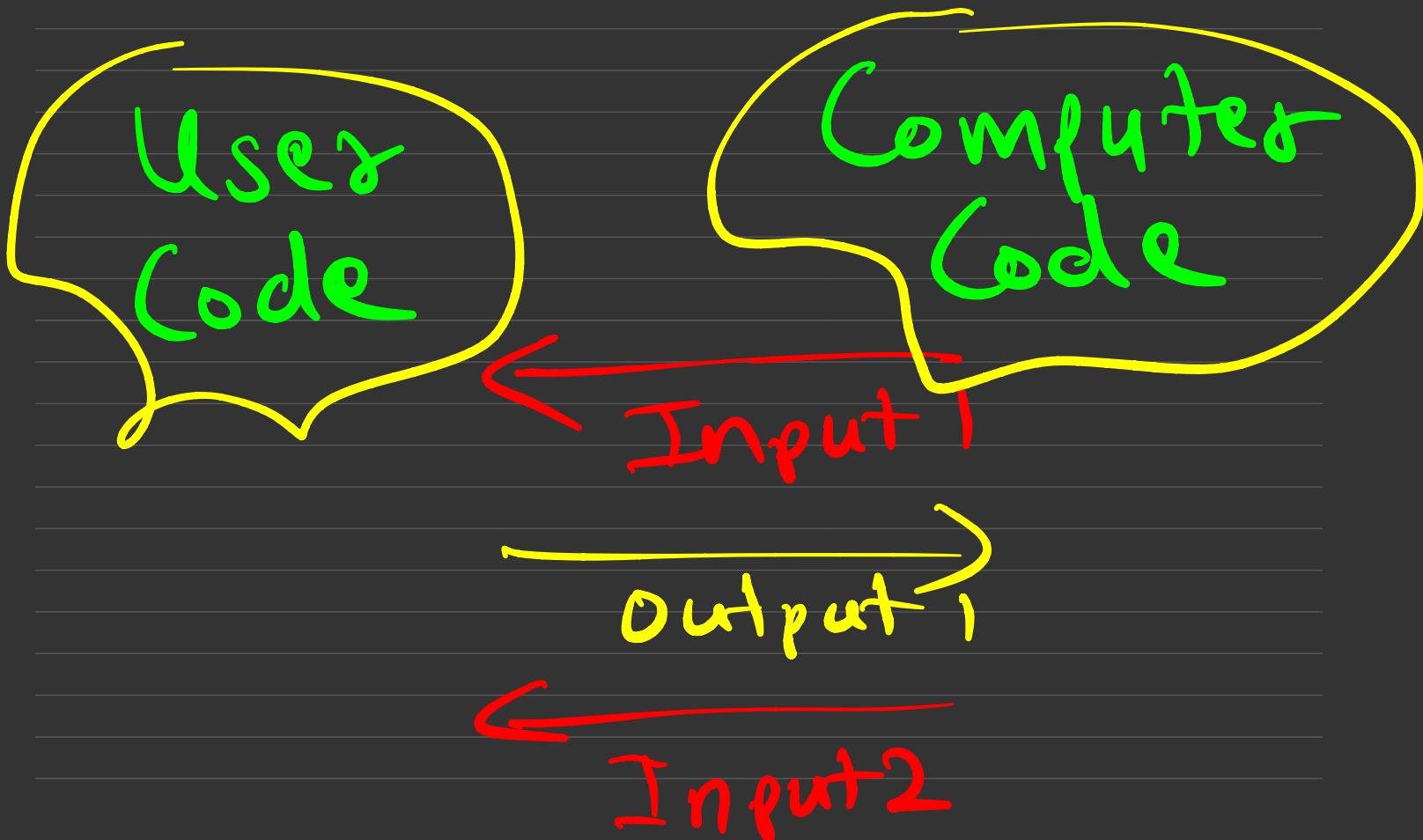
Online Queries

Offline Queries

Q

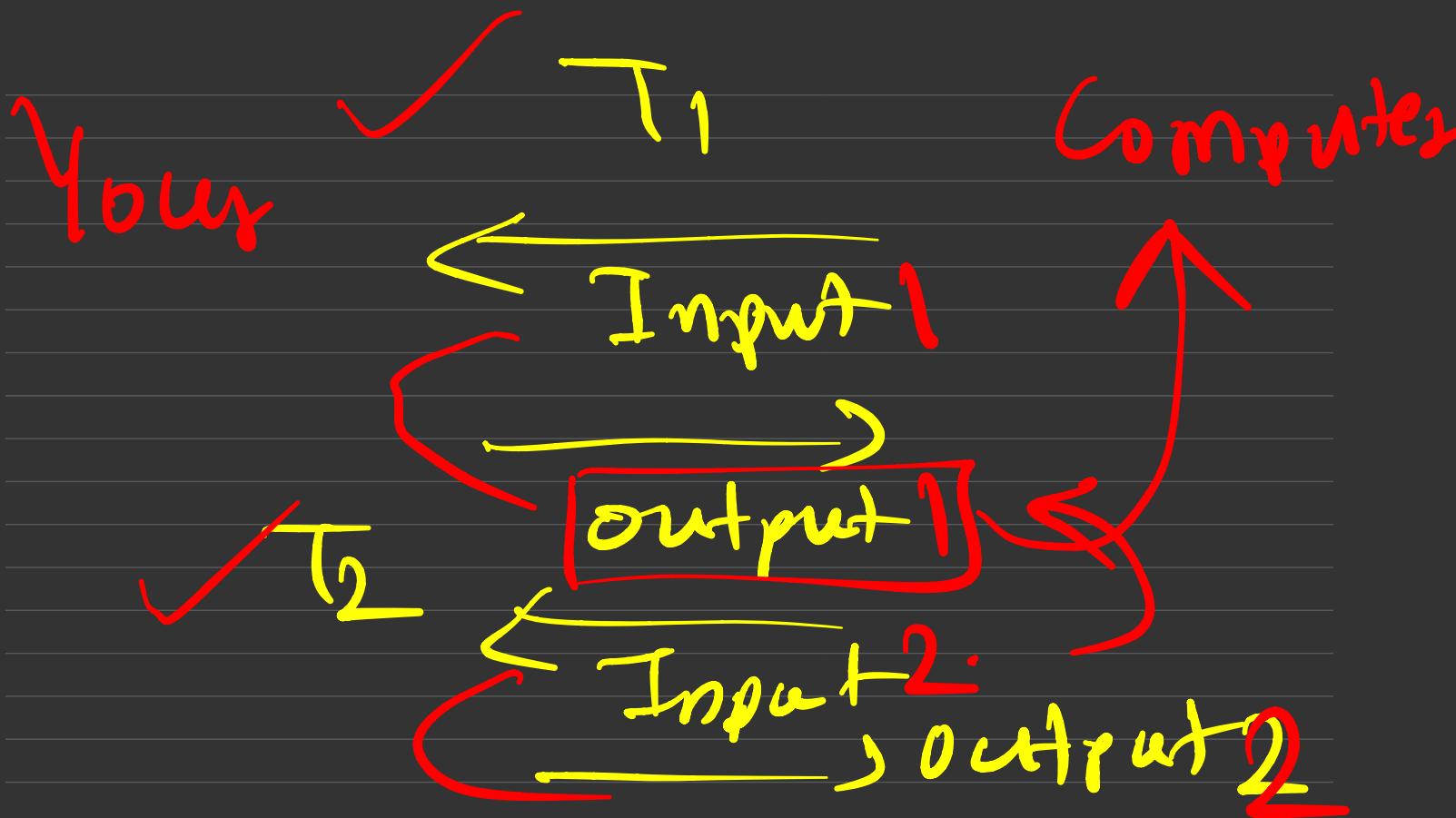






Output 2

{ T → test cases }  
↳ Output



$\tau_1$   $\tau_2$   $\tau_3$   $\tau_4$

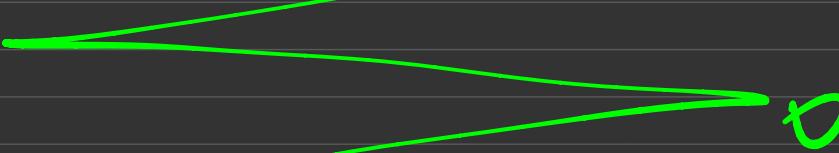


Independent

I



I



I



I





$\rightarrow$  (out << 1 ) ; } Inputs  
 $\rightarrow$  cout << 2 ;  
 $\rightarrow$  cout << 12

12

Buffer

==

TLE

(out << 1 <  
endl;  
))

(out << 1 << endl;

①  $1e^6$   
① (cout << 1 << endl);

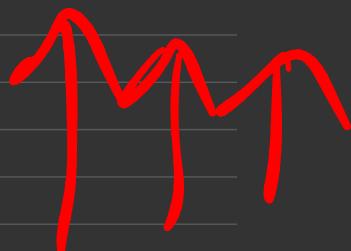
② (cout << 1 << "n");  
 $1e^6$

①  $a = a + 1$   $\gamma_{\text{Internal}}$   
 $\gamma_{\text{Comput}}$

②  $\text{cout} \ll a;$   $\gamma_{\text{I/O}}$   
 $\equiv$

$\text{I/O}$  Internal

$\rightarrow$  | I/O  
 $\equiv$













Input → Computer

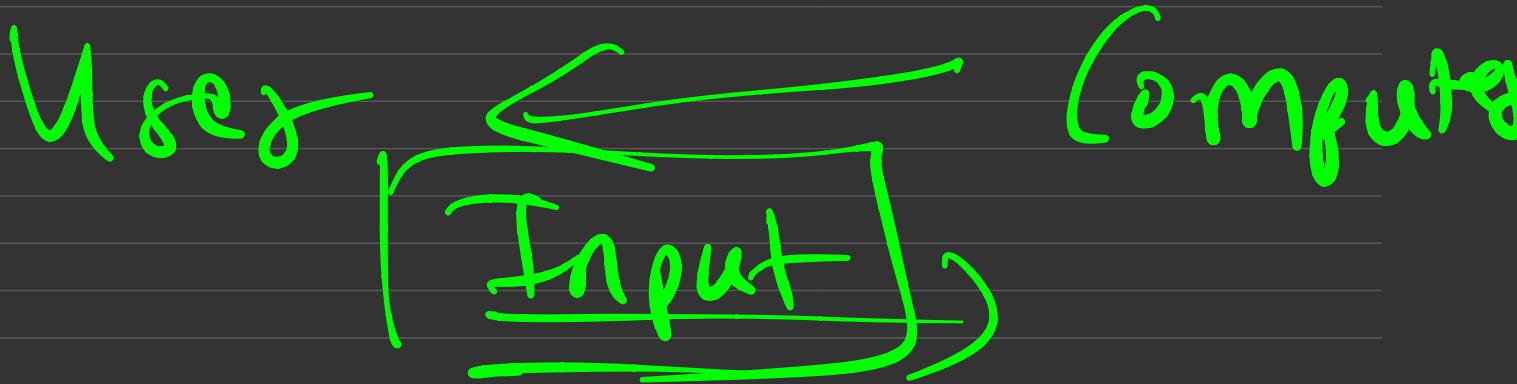
f(Out put) ← Input2 = 10

Deadlock

User ——————> Computer

← waiting for somet

User



Input

10



| Idleness

You → Computer

Idleness limit exceeded

`cout << anything << endl;`

`endl`

→ by default  
flushes output

`cout << 1 << "n";`

`endl;`

`1234`

`1  
2  
3 4`

cout << } <endl;

endl;

lec 0 TLE {

{ cout << | << endl;

lec 1 ==

{ cout << | << "|| \n ||";



low

mid

high



$-1e^9$

$1e^9$

$\text{mid} < \text{hidden}$   
 $\text{number}$   
 $10^9$

Array → known ??

|  $n < \text{hidden}$



hidden number

$\log_2(\text{range})$



< hidden

> hidden

= found

User

Computer

i

[

j

]

mid

<  
>  
==

```
{ cout << mid << endl; }  
char comput_output ;  
(in >> comput_output ; )  
}
```



Integer

<

>

?>

?>

↓

wavy line

< < < < < > > > > > >

F F F F F T T T T T

q q q lo li lo lo q q



0 → No 3 → Yes

1 → No \_\_\_\_\_

2 → No

9 elements  
 $> \frac{q}{2} = > 4$







{ don't find it  $\rightarrow$  NO  
 $> \frac{1}{2}$   
 $< \frac{1}{2}$

→ 10 random indices

$$\left\langle \frac{1}{2} \right\rangle^{10} \xrightarrow{\text{No}} \equiv \left\langle \frac{1}{1000} \right\rangle$$

$10$

Yes

$\underline{10^{18}}$

$< 0.001$

$s_0$

$\rightarrow \left(\frac{1}{2}\right)^{s_0}$

while (~~random~~)

$s \leftarrow \text{random} \rightarrow y$

10  
20 → | 50 Determ  
30 40 se 100 99.999999



TLE

2) one  $\rightarrow 10^6$

$\hookrightarrow$  one  $\left[\frac{1}{2}\right]^{10^6}$

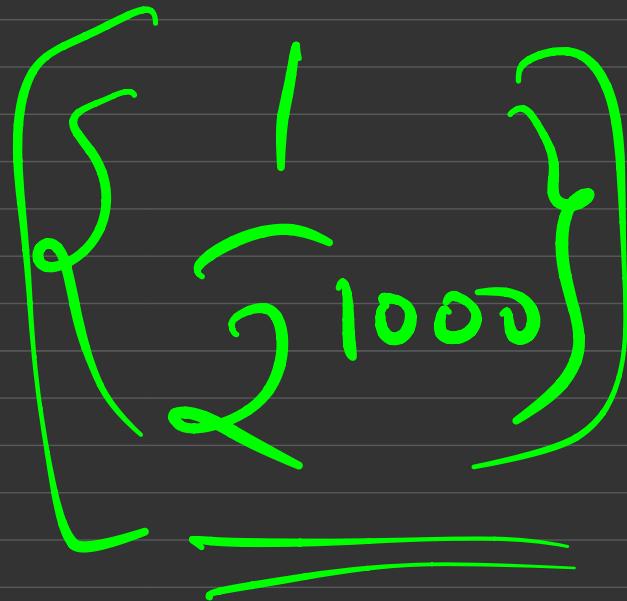
$\rightarrow \left[\frac{1}{2}\right]^{10^6 \cdot 2}$

$$\{ \begin{pmatrix} 1 \\ 100 \end{pmatrix} \rightarrow \begin{pmatrix} 100 \\ \end{pmatrix} =$$

$$= \begin{pmatrix} 1 \\ 2^{10} \end{pmatrix} \rightarrow \begin{pmatrix} 1 - \frac{1}{2^{10}} \\ \end{pmatrix} =$$

99



BS + Interactive

Random

