

Today's Content

1.

2.

3. Tricky Interview questions

Law Maths:

$$a^m \times a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(a^m)^n = a^{m \times n}$$

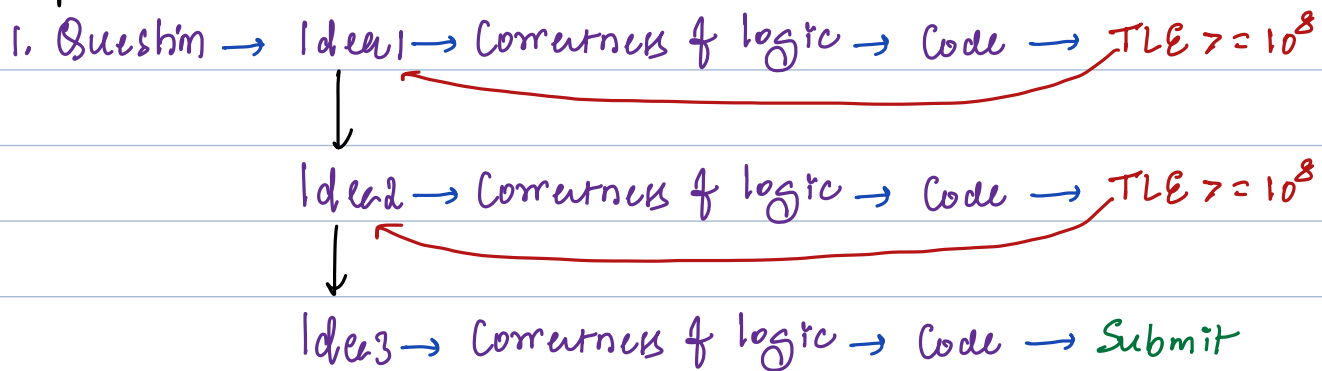
$$\text{int range} = \{-2 \times 10^9 \dots 2 \times 10^9\}$$

$$\text{long range} = \{-8 \times 10^{18} \dots 8 \times 10^{18}\}$$

Given Question:

1. Problem statement
2. Input format
3. Output format
4. Constraints
5. Examples
6. Explanation

Steps followed to solve question.



Q: Given an arr(N) check if pair (i,j) exists such that their sum = k

Constraints:

$$1 \leq N \leq 10^6 =$$

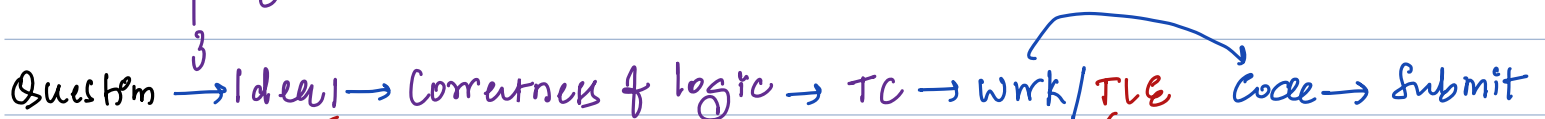
$$1 \leq arr[i] \leq 10^9$$

Idea: Generate all pairs.

```
for (int i = 0; i < N; i++) {  
    for (int j = 0; j < N; j++) {  
        if (arr[i] + arr[j] == k) {  
            //  
        }  
    }  
}
```

Iterations = $N + N^2 = O(N^2)$: TLE.

$$\begin{aligned} N &= 10^6 \\ N^2 &= (10^6)^2 = 10^{12} \gg 10^8 \end{aligned}$$



Idea based on Constraints

→ Input/Array size

Ex1: $1 \leq N \leq 10^3$

$1 \leq arr[i] \leq 10^4$

Accepted TC:

1. TC: $O(N^3) = (10^3)^3 = 10^9 > 10^8$ TLE
2. TC: $O(N^2) = (10^3)^2 = 10^6 < 10^8$ ✓
3. TC: $O(N \log N)$ ✓
4. TC: $O(N)$ ✓

Ex2: $1 \leq N \leq 10^6$

$1 \leq arr[i] \leq 10^6$

Accepted TC:

1. TC: $O(N^2) = (10^6)^2 = 10^{12}$ TLE
2. TC: $O(N \log N) = 10^6 * 20 = 2 * 10^7$ ✓
3. TC: $O(N)$ ✓

$$\log_2 10^6 = 20$$

$$2^{10} = 1024 \approx 1000 = 10^3$$

$$2^{20} \approx 10^6$$

$$2^{25} \approx 2^5 * 10^6 \\ = 32 * 10^6$$

Ex3: $1 \leq N \leq 25$

$1 \leq arr[i] \leq 10^6$

Accepted TC:

1. TC: $O(N!) = 25! \approx > 10^8$ TLE
2. TC: $O(2^N) = 2^{25} = 3.2 * 10^7 < 10^8$ ✓
↳ Estimate subsets/subsequences

Ex4: $1 \leq N \leq 10$

$1 \leq arr[i] \leq 10^5$

Accepted TC: → Permutations

1. TC: $O(N!) = 10! = 3.5 * 10^6 < 10^8$ ✓

Datatype based constraints

Q1: Given arr[] calculate sum of array elements

Constraints:

$1 \leq N \leq 10^5$ } According to constraints, Range of sum.

$-10^9 \leq arr[i] \leq 10^9$ } Ex: $1 \leq \text{sum} \leq 10^{14}$ Ex:

$arr[i] = \{1\}$

$arr[10^5] = \{10^9, 10^9, \dots, 10^9\}$

~~long int~~ sum = 0; // Issue: sum exceeding int range. \Rightarrow long.

for(int i = 0; i < N; i++)

sum = sum + arr[i];

print(sum);

Q: For below constraints, range of sum variable

$1 \leq N \leq 10^5$

$-10^9 \leq arr[i] \leq 10^9$

Ex: Min: $-10^9 * 10^5 = -10^{14}$

Ex: Max: $10^9 * 10^5 = 10^{14}$

$arr[10^5] = \{-10^9, -10^9, -10^9, \dots\}$

$arr[10^5] = \{10^9, 10^9, 10^9, \dots, 10^9\}$

Approach:

Question \rightarrow Idea \rightarrow Correctness \rightarrow TC \rightarrow Work/TLE \rightarrow Code \rightarrow Submit

a. Observations

a. Dry Run

practice

a. Datatype

b. Constraints

b. Identify

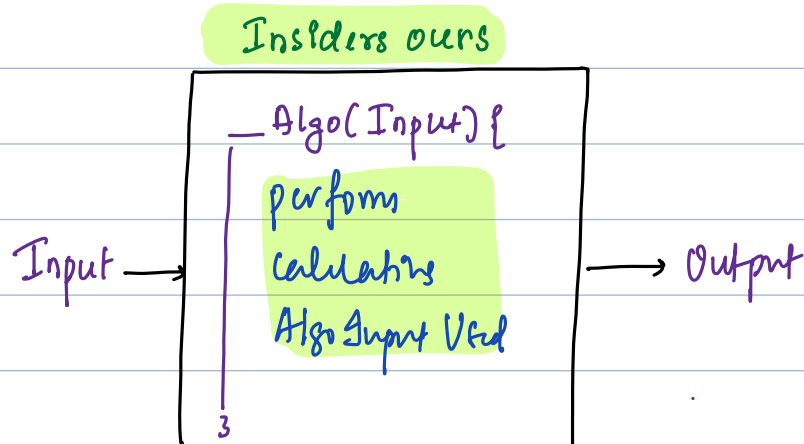
b. Handle

c. Examples

Edge Case

Edge Case

Space Complexity: New amount of extra space taken by Algo, during its execution



Note: While calculating space complexity neglect input & output space.
Consider space taken by algorithm

Note: To analyse space complexity, we will use Big O

Ex: $\text{int} = 4B$ $\text{long} = 8B$

\swarrow Input
`void Algo1(int n) {`

`int x = n; $\rightarrow 4B$`

`int y = n * n $\rightarrow 4B$`

`long z = x * y $\rightarrow 8B$`

Total = $16B \rightarrow$ Constant space $\rightarrow O(1)$

\swarrow Input
`void fun(int n) {`

`int arr[10]; $\rightarrow 40B$`

`int x, y; $\rightarrow 8B$`

`long z; $\rightarrow 8B$`

`int a[n]; $\rightarrow 4N$`

Total space = $56 + 4N$

Big O = $O(N)$

void func(int N){

int x = N; $\rightarrow 4B$

int y = x * x; $\rightarrow 4B$

long z = x * y; $\rightarrow 8B$

int arr[N]; $\rightarrow 4N$

long d[N][N]; $\rightarrow 8N^2$

Total Space = $16 + 4N + 8N^2$

BigO = $O(N^2)$

}

Q: Given an arr[N] return max of an array.

Inputs

int maxarr(int arr[], int N){

Total Space = $4B \rightarrow O(1)$

Output \rightarrow int max = INT_MIN;

Time Comp = $O(N)$

for(int i = 0; i < N; i++){

if(arr[i] > max){

max = arr[i];

}

return max;

}