

COMPITATIVE ASSIGNMENT

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BT NO: 36

Assignment 1: Segment Tree for Range Sum Query

Problem Statement:

You are given an array of N integers. Build a Segment Tree to efficiently answer multiple range sum queries.

Input Format

- The first line contains an integer T , the number of test cases.
- For each test case:
 - The first line contains an integer N .
 - The second line contains N integers.
 - The next line contains an integer Q , the number of queries.
 - Each of the next Q lines contains two integers L and R .

Output Format

For each query, print the sum of elements in the range $[L, R]$.

Constraints

- $1 \leq T \leq 20$
- $1 \leq N \leq 200000$
- $0 \leq A[i] \leq 10^9$

Sample Input

```
1
5
1 3 5 7 9
3
0 2
```

```
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1 import sys
2 sys.setrecursionlimit(10**7)
3 def build(node, start, end):
4     if start == end:
5         seg[node] = arr[start]
6     else:
7         mid = (start + end) // 2
8         build(2*node, start, mid)
9         build(2*node + 1, mid + 1, end)
10        seg[node] = seg[2*node] + seg[2*node + 1]
11
12 def query(node, start, end, l, r):
13     if r < start or end < l:
14         return 0
15     if l <= start and end <= r:
16         return seg[node]
17     mid = (start + end) // 2
18     return query(2*node, start, mid, l, r) + \
19            query(2*node + 1, mid + 1, end, l, r)
20 T = int(input())
21 for _ in range(T):
22     N = int(input())
23     arr = list(map(int, input().split()))
24
25     seg = [0] * (4 * N)
26     build(1, 0, N - 1)
27
28     Q = int(input())
29     for _ in range(Q):
30         L, R = map(int, input().split())
31         print(query(1, 0, N - 1, L, R))
32
1
5
1 3 5 7 9
3
0 2
9
1 3
15
2 4
21
...Program finished with exit code 0
Press ENTER to exit console.
```

JAVA CODE:

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Language: Java

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1import java.util.*;
2
3public class Main {
4
5 static long[] segTree;
6 static long[] arr;
7
8 static void build(int node, int start, int end) {
9 if (start == end) {
10 segTree[node] = arr[start];
11 } else {
12 int mid = (start + end) / 2;
13 build(2 * node, start, mid);
14 build(2 * node + 1, mid + 1, end);
15 segTree[node] = segTree[2 * node] + segTree[2 * node + 1];
16 }
17 }
18
19 static long query(int node, int start, int end, int l, int r) {
20 if (r < start || end < l)
21 return 0;
22 if (l <= start && end <= r)
23 return segTree[node];
24
25 int mid = (start + end) / 2;
26 return query(2 * node, start, mid, l, r)
27 + query(2 * node + 1, mid + 1, end, l, r);
28 }
29
30 public static void main(String[] args) {
31 Scanner sc = new Scanner(System.in);
32
33 int T = sc.nextInt();
34 while (T-- > 0) {
35 int N = sc.nextInt();
36 arr = new long[N];
37 for (int i = 0; i < N; i++)
38 arr[i] = sc.nextLong();
39 segTree = new long[4 * N];
40 build(1, 0, N - 1);
41 }
42 }
43}

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input
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