

Competitive Programming

Week3.6

Assignment-3(Wednesday)

Segment Tree with Point Updates

Code:

```
import java.util.*;

class Main
{
    static long[] seg;

    static int n;

    static void build(int idx,int l,int r,int[] arr)
    {
        if(l==r)
        {
            seg[idx]=arr[l];
            return;
        }
        int mid=(l+r)/2;
        build(2*idx+1,l,mid,arr);
        build(2*idx+2,mid+1,r,arr);
        seg[idx]=seg[2*idx+1]+seg[2*idx+2];
    }

    static void update(int idx,int l,int r,int pos,int val)
    {
        if(l==r)
        {
            seg[idx]=val;
        }
    }
}
```

```

        return;
    }
    int mid=(l+r)/2;
    if(pos<=mid)
        update(2*idx+1,l,mid,pos,val);
    else
        update(2*idx+2,mid+1,r,pos,val);

    seg[idx]=seg[2*idx+1]+seg[2*idx+2];
}
static long query(int idx,int l,int r,int ql,int qr)
{
    if(qr<l||ql>r)
        return 0;
    if(ql<=l&&qr<=r)
        return seg[idx];
    int mid=(l+r)/2;
    return query(2*idx+1,l,mid,ql,qr)
        + query(2*idx+2,mid+1,r,ql,qr);
}
public static void main(String[] args)
{
    Scanner sc=new Scanner(System.in);
    int T=sc.nextInt();

    while(T-->0)
    {
        n=sc.nextInt();

```

```

int[] arr=new int[n];
for(int i=0;i<n;i++)
    arr[i]=sc.nextInt();

seg=new long[4*n];
build(0,0,n-1,arr);

int Q=sc.nextInt();
while(Q-->0)
{
    int type=sc.nextInt();
    if(type==1)
    {
        int i=sc.nextInt();
        int x=sc.nextInt();
        update(0,0,n-1,i,x);
    }
    else
    {
        int L=sc.nextInt();
        int R=sc.nextInt();
        System.out.println("ANS: "+query(0,0,n-1,L,R));
    }
}
}
}

```

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Language Java

```
1 import java.util.*;
2 class Main
3 {
4     static long[] seg;
5     static int n;
6     static void build(int idx,int l,int r,int[] arr)
7     {
8         if(l==r)
9         {
10             seg[idx]=arr[l];
11             return;
12         }
13         int mid=(l+r)/2;
14         build(2*idx+1,l,mid,arr);
15         build(2*idx+2,mid+1,r,arr);
16         seg[idx]=seg[2*idx+1]+seg[2*idx+2];
17     }
18     static void update(int idx,int l,int r,int pos,int val)
19     {
20         if(l==r)
21         {
22             seg[idx]=val;
23             return;
24         }
25         int mid=(l+r)/2;
26         if(pos<=mid)
27             update(2*idx+1,l,mid,pos,val);
28         else
29             update(2*idx+2,mid+1,r,pos,val);
30         seg[idx]=seg[2*idx+1]+seg[2*idx+2];
31     }
32     static long query(int idx,int l,int r,int ql,int qr)
33     {
34         if(qr<=l||ql>=r)
35             return 0;
36         if(ql<=l&&r<=qr)
37             return seg[idx];
38         int mid=(l+r)/2;
39         return query(2*idx+1,l,mid,ql,qr)
40             + query(2*idx+2,mid+1,r,ql,qr);
41     }
42     public static void main(String[] args)
43     {
44         Scanner sc=new Scanner(System.in);
45         int T=sc.nextInt();
46         while(T-->0)
47         {
48             n=sc.nextInt();
49             int[] arr=new int[n];
50             for(int i=0;i<n;i++)
51                 arr[i]=sc.nextInt();
52             seg=new long[4*n];
53             build(0,0,n-1,arr);
54             int Q=sc.nextInt();
55             while(Q-->0)
56             {
57                 int type=sc.nextInt();
58                 if(type==1)
59                 {
60                     int i=sc.nextInt();
61                     int x=sc.nextInt();
62                     update(0,0,n-1,i,x);
63                 }
64                 else
65                 {
66                     int l=sc.nextInt();
67                     int r=sc.nextInt();
68                     System.out.println("ANS: "+query(0,0,n-1,l,r));
69                 }
70             }
71         }
72     }
```

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Language Java

```
35 if(qr<=l||ql>=r)
36     return 0;
37 if(ql<=l&&r<=qr)
38     return seg[idx];
39 int mid=(l+r)/2;
40 return query(2*idx+1,l,mid,ql,qr)
41     + query(2*idx+2,mid+1,r,ql,qr);
42 }
43 public static void main(String[] args)
44 {
45     Scanner sc=new Scanner(System.in);
46     int T=sc.nextInt();
47     while(T-->0)
48     {
49         n=sc.nextInt();
50         int[] arr=new int[n];
51         for(int i=0;i<n;i++)
52             arr[i]=sc.nextInt();
53         seg=new long[4*n];
54         build(0,0,n-1,arr);
55         int Q=sc.nextInt();
56         while(Q-->0)
57         {
58             int type=sc.nextInt();
59             if(type==1)
60             {
61                 int i=sc.nextInt();
62                 int x=sc.nextInt();
63                 update(0,0,n-1,i,x);
64             }
65             else
66             {
67                 int l=sc.nextInt();
68                 int r=sc.nextInt();
69                 System.out.println("ANS: "+query(0,0,n-1,l,r));
70             }
71         }
72     }
```

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Language Java

Main.java

```
1  // type -> recursive;
2  if (type==1)
3  {
4      int i=sc.nextInt();
5      int x=sc.nextInt();
6      update(0,0,n-1,i,x);
7  }
8  else
9  {
10     int l=sc.nextInt();
11     int r=sc.nextInt();
12     System.out.println("ANS: "+query(0,0,n-1,l,r));
13 }
14 }
15 }
```

input

```
1
5
1 3 5 7 9
4
2 1 3
ANS: 15
1 2 10
2 1 3
ANS: 20
2 0 4
ANS: 30
...Program finished with exit code 0
```

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