线段树

人员

卢炫佑、隋天翼、刘新睿、范家郡、刘锦轩、牛晓晨、韩承煊 到课

上周作业检查

上周作业链接: https://vjudge.net/contest/693751

Begin: 2025-02-15 08:30 CST

☆ 2025-0215 ~ 0216 五队上课(综合练习)

End: 2025-06-20 08:30 CST

Elapsed: 6:23:43:43 Running **Remaining:** 118:00:16:16

Overview | Problem | Status | Rank (6:23:43:42) | Discuss | Setting | Clone | Update | Delete

Rank	Team	Score	Penalty	A 14 / 32	B 13 / 25	C 6 / 8	D 2 / 2
1	misaka16384 (黄诗琦)	4	8884	8:47:03 (-5)	1:01:46:54 (-1)	**1:02:14:24** **(-1)**	3:12:55:54
2	dldltangmen (韩承煊)	3	6123	1:06:49:41	10:24:32 (-1)	2:12:29:11	
3	sty0948 (隋...	3	13110	4:12:00:06	1:47:50 (-2)	4:12:02:42	
4	ikunTLE (方冠霖)	3	15128	3:12:46:54	1:09:57:52	5:13:23:55	
5	dana230513 (金一航)	3	27994	6:10:56:59	6:11:12:34 (-3)	6:11:24:44	
6	two_tiger (卢炫佑)	3	28084	6:10:55:13	6:11:50:02	6:13:19:16	
7	niuxiaochen	2	235	**1:10:35** **(-2)**	**1:44:57** **(-1)**	(-1)	
8	chx123bc (陈瀚霄_chx)	2	978	7:33:23	8:25:34 (-1)		
9	zhn123bc	2	1087	8:19:10 (-1)	8:48:33 (-2)		
10	longlong_int (刘锦轩)	2	4171	1:12:14:54	1:09:16:38		
11	Hanhj (韩鸿钜)	2	19030	6:13:55:06	6:15:15:09		
12	ccx123bc	1	540		8:40:22 (-1)		
13	lzy123bc (AC来得好快)	1	551	8:51:09 (-1)			
14	huhexuan (胡赫轩)	1	667				**11:07:37**
15	qp_an	1	830	(-5)	13:50:08		
16	fjj123bc (范家郡)	1	9489	6:13:29:07 (-2)			
17	lxr123bc	1	9518	6:14:18:05 (-1)			
18	lzy1031 (李政毅)	0	0	(-1)			
19	FeatherCrow (许岩)	0	0				

作业

https://www.luogu.com.cn/contest/232116 (课上讲了 A ~ D 几个题, 课后作业是 E 题)

课堂表现

同学们上课听讲都很认真, 但是线段树只靠听是不够的, 同学们课下一定要多练才行, 老师要求同学们课下把 B 题和 C 题每道题目写 3 遍。

课堂内容

CF19B Checkout Assistant

```cpp
#include <bits/stdc++.h>

using namespace std;

typedef long long LL;
const int maxn = 2000 + 5;
const LL inf = 0x3f3f3f3f3f3f3f3f;
LL f[2*maxn];

int main()
{
  int n; cin >> n;
  memset(f, 0x3f, sizeof(f)); f[0] = 0;
  for (int j = 1; j <= n; j++) {
    int t, c; cin >> t >> c; ++t;
    for (int i = 2*maxn-1; i >= t; --i) f[i] = min(f[i], f[i-t]+c);
  }

  LL res = inf;
  for (int i = 2*maxn-1; i >= n; --i) res = min(res, f[i]);
  cout << res << endl;
  return 0;
}
```

P3865 【模板】ST 表 && RMQ 问题

```cpp
#include <bits/stdc++.h>

using namespace std;

const int N = 1e5 + 5, M = 20;
int _lg2[N], f[N][M];

int query(int l, int r) {
  int len = r - l + 1;
  int _k = _lg2[len];
```

```
  return max(f[l][_k], f[r-(1<<_k)+1][_k]);
}

int main()
{
  ios::sync_with_stdio(false);
  cin.tie(0);

  for (int i = 0; (1<<i) < N; ++i) _lg2[1<<i] = i;
  for (int i = 1; i < N; ++i) {
    if (!_lg2[i]) _lg2[i] = _lg2[i-1];
  }

  int n, m; cin >> n >> m;
  for (int i = 1; i <= n; ++i) {
    int x; cin >> x; f[i][0] = x;
  }

  for (int k = 1; k < M; ++k) {
    for (int i = 1; i+(1<<k)-1 <= n; ++i) {
      f[i][k] = max(f[i][k-1], f[i+(1<<(k-1))][k-1]);
    }
  }

  while (m -- ) {
    int l, r; cin >> l >> r;
    cout << query(l, r) << "\n";
  }
  return 0;
}
```

P1531 I Hate It

```
#include <bits/stdc++.h>

using namespace std;

const int maxn = 2e5 + 5;
struct node {
    int l, r, maxx;
} tr[maxn*4];
int w[maxn];

void pushup(int u) {
    tr[u].maxx = max(tr[u*2].maxx, tr[u*2+1].maxx);
}

void build(int u, int l, int r) {
    tr[u] = {l, r, 0};
    if (l == r) { tr[u].maxx = w[l]; return; }
```

```
    int mid = (l + r) / 2;
    build(u*2, l, mid), build(u*2+1, mid+1, r);
    pushup(u);
}

void modify(int u, int pos, int k) {
    if (tr[u].l==pos && tr[u].r==pos) {
        tr[u].maxx = max(tr[u].maxx, k); return;
    }

    int mid = (tr[u].l + tr[u].r) / 2;
    if (pos <= mid) modify(u*2, pos, k);
    else modify(u*2+1, pos, k);
    pushup(u);
}

int query(int u, int l, int r) {
    if (tr[u].l>=l && tr[u].r<=r) return tr[u].maxx;

    int mid = (tr[u].l + tr[u].r) / 2;
    int res = 0;
    if (l <= mid) res = query(u*2, l, r);
    if (r > mid) res = max(res, query(u*2+1, l, r));
    return res;
}

int main()
{
    int n, m; cin >> n >> m;
    for (int i = 1; i <= n; i++) cin >> w[i];
    build(1, 1, n);

    while (m -- ) {
        char op[2]; int a, b; cin >> op >> a >> b;
        if (op[0] == 'Q') cout << query(1, a, b) << endl;
        else modify(1, a, b);
    }
    return 0;
}
```

P2068 统计和

```
#include <bits/stdc++.h>

using namespace std;

typedef long long LL;
const int maxn = 1e5 + 5;
struct node {
    int l, r;
    LL sum;
```

```
} tr[maxn*4];

void pushup(int u) {
    tr[u].sum = tr[u*2].sum + tr[u*2+1].sum;
}

void build(int u, int l, int r) {
    tr[u] = {l, r, 0};
    if (l == r) return;
    int mid = (l + r) / 2;
    build(u*2, l, mid), build(u*2+1, mid+1, r);
}

void modify(int u, int pos, int k) {
    if (tr[u].l==pos && tr[u].r==pos) {
        tr[u].sum += k; return;
    }

    int mid = (tr[u].l + tr[u].r) / 2;
    if (pos <= mid) modify(u*2, pos, k);
    else modify(u*2+1, pos, k);
    pushup(u);
}

LL query(int u, int l, int r) {
    if (tr[u].l>=l && tr[u].r<=r) return tr[u].sum;

    int mid = (tr[u].l + tr[u].r) / 2;
    LL sum = 0;
    if (l <= mid) sum += query(u*2, l, r);
    if (r > mid) sum += query(u*2+1, l, r);
    return sum;
}

int main()
{
    int n; cin >> n; build(1, 1, n);
    int m; cin >> m;
    while (m -- ) {
        char op[2]; int a, b; cin >> op >> a >> b;
        if (op[0] == 'x') {
            modify(1, a, b);
        } else {
            cout << query(1, a, b) << "\n";
        }
    }
    return 0;
}
```

P3372 【模板】线段树 1

```cpp
#include <bits/stdc++.h>

using namespace std;

typedef long long LL;
const int maxn = 1e5 + 5;
struct node {
  int l, r;
  LL add;
  LL sum;
} tr[maxn*4];
LL w[maxn];

void pushup(int u) { tr[u].sum = tr[u*2].sum + tr[u*2+1].sum; }

void pushdown(int u) {
  if (tr[u].add) {
    LL t = tr[u].add;
    node &ll = tr[u*2], &rr = tr[u*2+1];
    ll.add += t, ll.sum += t * (ll.r - ll.l + 1);
    rr.add += t, rr.sum += t * (rr.r - rr.l + 1);
    tr[u].add = 0;
  }
}

void build(int u, int l, int r) {
  tr[u] = {l, r, 0, 0};
  if (l == r) { tr[u].sum = w[l]; return; }

  int mid = (l + r) / 2;
  build(u*2, l, mid), build(u*2+1, mid+1, r);
  pushup(u);
}

void modify(int u, int l, int r, LL k) {
  if (tr[u].l>=l && tr[u].r<=r) {
    tr[u].add += k, tr[u].sum += k*(tr[u].r-tr[u].l+1); return;
  }

  pushdown(u);
  int mid = (tr[u].l + tr[u].r) / 2;
  if (l <= mid) modify(u*2, l, r, k);
  if (r > mid) modify(u*2+1, l, r, k);
  pushup(u);
}

LL query(int u, int l, int r) {
  if (tr[u].l>=l && tr[u].r<=r) return tr[u].sum;

  pushdown(u);
  int mid = (tr[u].l + tr[u].r) / 2;
  LL res = 0;
  if (l <= mid) res += query(u*2, l, r);
```

```
  if (r > mid) res += query(u*2+1, l, r);
  return res;
}

int main()
{
  int n, m; cin >> n >> m;
  for (int i = 1; i <= n; ++i) cin >> w[i];
  build(1, 1, n);

  while (m -- ) {
    int op; cin >> op;
    if (op == 1) {
      int l, r; LL k; cin >> l >> r >> k;
      modify(1, l, r, k);
    } else {
      int l, r; cin >> l >> r;
//      cout << "----------------- ";
      cout << query(1, l, r) << endl;
    }
  }
  return 0;
}
```