

线段树

人员

赵广宇、刘智予、李政毅、张皓宁、韩鸿钜、方冠霖、金一航、曹承贤、陈瀚霄、黄诗琦、付丙霖 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: 7:06:58:29

Running

Remaining: 117:17:01:30

OverviewProblemStatusRank (7:06:58:27)Discuss

SettingCloneUpdateDelete

| Rank | Team | Score | Penalty | A | B | C | D |
|------|---------------------------------|-------|---------|--------------------|--------------------|--------------------|------------|
| | | | | 14 / 32 | 14 / 28 | 13 / 20 | 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 | ☆ niuxiaochen | 3 | 10581 | 1:10:35 (-2) | 1:44:57 (-1) | 7:04:05:53 (-1) | |
| 4 | ☆ chx123bc (陈瀚霄_chx) | 3 | 11244 | 7:33:23 | 8:25:34 (-1) | 7:02:45:57 (-1) | |
| 5 | ☆ zhn123bc | 3 | 11462 | 8:19:10 (-1) | 8:48:33 (-2) | 7:04:35:05 (-1) | |
| 6 | ☆ Hacker_Cracker sty0948 (隋...) | 3 | 13110 | 4:12:00:06 | 1:47:50 (-2) | 4:12:02:42 | |
| 7 | ☆ ikunTLE (方冠霖) | 3 | 15128 | 3:12:46:54 | 1:09:57:52 | 5:13:23:55 | |
| 8 | ☆ dana230513 (金一航) | 3 | 27994 | 6:10:56:59 | 6:11:12:34 (-3) | 6:11:24:44 | |
| 9 | ☆ two_tiger (卢炫佑) | 3 | 28084 | 6:10:55:13 | 6:11:50:02 | 6:13:19:16 | |
| 10 | ☆ Hanhj (韩鸿钜) | 3 | 29519 | 6:13:55:06 | 6:15:15:09 | 7:06:29:40 (-1) | |
| 11 | ☆ fj123bc (范家郡) | 3 | 29764 | 6:13:29:07 (-2) | 7:00:04:19 | 7:01:50:37 | |
| 12 | ☆ longlong_int (刘锦轩) | 2 | 4171 | 1:12:14:54 | 1:09:16:38 | | |
| 13 | ☆ ccx123bc | 2 | 10913 | | 8:40:22 (-1) | 7:04:33:15 (-1) | |
| 14 | ☆ qp_an | 2 | 11311 | (-5) | 13:50:08 | 7:06:21:18 (-1) | |
| 15 | ☆ lzy123bc (AC来得好快) | 1 | 551 | 8:51:09 (-1) | (-2) | | |
| 16 | ☆ huhexuan (胡赫轩) | 1 | 667 | | | | 11:07:37 |
| 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

```
#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

```
#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

```
#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;
}
```