综合混练

人员

赵广宇、李政毅、张皓宁、金一航、黄诗琦、卢炫佑、曹承贤、韩鸿钜 到课, 王彦臻 线上

上周作业检查

上周作业链接: https://www.luogu.com.cn/contest/238522

2025-0329 五队上课 (综合练习)

报名 编辑比赛

题目数 4 报名人数 25

比赛说明 题目列表 排行榜

名次	参赛者	总分	A	B	C	D
#1	张皓宁	400 (2.35d)	100 (7.45h)	100 (8.58h)	100 (8.90h)	100 (1.31d)
#2	方冠霖	400 (2.46d)	100 (7.67h)	100 (8.64h)	100 (8.94h)	100 (1.40d)
#3	黄诗琦	400 (4.77d)	100 (7.55h)	100 (1.49d)	100 (1.44d)	100 (1.52d)
#4	隋天翼	400 (9.25d)	100 (30.07min)	100 (13.87h)	100 (2.20d)	100 (6.45d)
#5	郑岩泽	360 (2.43d)	100 (9.32h)	100 (9.32h)	100 (9.32h)	60 (1.26d)
#6	曹承贤	360 (8.27d)	100 (7.68h)	100 (8.59h)	100 (8.95h)	60 (7.22d)
#7	金一航	350 (21.46d)	100 (6.56d)	100 (8.66h)	100 (7.27d)	50 (7.27d)
#8	付丙霖	300 (1.08d)	100 (8.31h)	100 (8.69h)	100 (8.95h)	
#9	赵广宇	300 (1.93d)	100 (8.35h)	100 (8.94h)	100 (1.21d)	
#10	王彦臻	300 (6.98d)	100 (7.60h)	100 (8.70h)	100 (6.30d)	
#11	刘新睿	300 (7.74d)	100 (1.49h)	100 (1.36d)	100 (6.32d)	
#12	卢炫佑	290 (13.38d)	100 (7.62h)	0	100 (6.53d)	90 (6.53d)
#13	刘智予	200 (16.66h)	100 (7.68h)		100 (8.98h)	
#14	陈瀚霄	200 (16.69h)	100 (7.60h)	100 (9.09h)		
#15	牛晓晨	200 (7.04d)	100 (49.35min)		100 (7.00d)	
#16	李政毅	200 (7.62d)	100 (8.71h)	100 (7.26d)		
#17	刘锦轩	100 (15.65min)	100 (15.65min)	0		
#18	韩承煊	100 (47.28min)	100 (47.28min)			
#19	范家郡	100 (1.33h)	100 (1.33h)	0	0	0
#20	方冠霖	100 (1.40d)				100 (1.40d)

数据导出 (CSV 格式)

作业

https://vjudge.net/contest/707147 (课上讲了 A ~ B 这些题, 课后作业是 C D 题)

课堂表现

张皓宁、曹承贤、金一航、黄诗琦、卢炫佑 这几位同学每次做作业都积极做, 其他同学最近几次作业完成情况不是很好, 同学们课下要积极写作业, 遇到问题沉住性子慢慢调。

课堂内容

P4551 最长异或路径

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

using namespace std;

const int maxn = 100000 + 5;
struct node {
  int to, value;
};
vector<node> vec[maxn];

int tr[maxn*32][2], idx = 0;
void tr_insert(int x) {
  int p = 0;
  for (int i = 31; i >= 0; --i) {
    int u = (x>>i)&1;
    if (!tr[p][u]) tr[p][u] = ++idx;
    p = tr[p][u];
  }
}
int tr_query(int x) {
  int p = 0, res = 0;
  for (int i = 31; i >= 0; --i) {
    int u = (x>>i)&1;
    if (tr[p][u^1]) p = tr[p][u^1], res += ((u^1)<<i);
    else p = tr[p][u], res += (u<<i);
  }
  return res;
}

int f[maxn], res = 0;
void dfs(int u, int fa, int val) {
  f[u] = val;

  tr_insert(val);
  int val2 = tr_query(val);
  res = max(res, val^val2);

  for (node it : vec[u]) {
    if (it.to != fa) dfs(it.to, u, val^it.value);
  }
}
```

```
int main()
{
  int n; cin >> n;
  for (int i = 1; i <= n-1; ++i) {
    int u, v, w; cin >> u >> v >> w;
    vec[u].push_back({v, w}), vec[v].push_back({u, w});
  }

  dfs(1, -1, 0);

  cout << res << endl;
  return 0;
}
```

P1253 扶苏的问题

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

using namespace std;

typedef long long LL;
const int maxn = 1e6 + 5;
const LL inf = 0x3f3f3f3f3f3f3f3f;
struct node {
  int l, r;
  LL add;
  LL sim;
  LL 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 pushdown(int u) {
  if (tr[u].sim != inf) {
    LL t = tr[u].sim + tr[u].add;
    node &ll = tr[u*2], &rr = tr[u*2+1];
    ll.sim = t, ll.add = 0, ll.maxx = t;
    rr.sim = t, rr.add = 0, rr.maxx = t;
    tr[u].sim = inf, tr[u].add = 0;
  } else if (tr[u].add) {
    LL t = tr[u].add;
    node &ll = tr[u*2], &rr = tr[u*2+1];
    ll.add += t, ll.maxx += t;
    rr.add += t, rr.maxx += t;
    tr[u].add = 0;
  }
}

void build(int u, int l, int r) {
```

```
  tr[u] = {l, r, 0, inf};
  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 l, int r, int x) {
  if (tr[u].l>=l && tr[u].r<=r) {
    tr[u].sim = x, tr[u].add = 0, tr[u].maxx = x; return;
  }

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

void modify2(int u, int l, int r, int x) {
  if (tr[u].l>=l && tr[u].r<=r) {
    tr[u].add += x, tr[u].maxx += x; return;
  }

  pushdown(u);
  int mid = (tr[u].l + tr[u].r) / 2;
  if (l <= mid) modify2(u*2, l, r, x);
  if (r > mid) modify2(u*2+1, l, r, x);
  pushup(u);
}

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

  pushdown(u);
  int mid = (tr[u].l + tr[u].r) / 2;
  LL res = -inf;
  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()
{
  ios::sync_with_stdio(false);
  cin.tie(0);

  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, x; cin >> l >> r >> x; modify(1, l, r, x);
    } else if (op == 2) {
      int l, r, x; cin >> l >> r >> x; modify2(1, l, r, x);
    } else {
      int l, r; cin >> l >> r;
//      cout << "----------------- ";
      cout << query(1, l, r) << "\n";
    }
  }
  return 0;
}
```

P1168 中位数

```
// 二分+树状数组
// 时间复杂度: nlognlogn
#include <bits/stdc++.h>

using namespace std;

vector<int> ys;
int yFind(int x) { return lower_bound(ys.begin(), ys.end(), x) - ys.begin(); }

const int maxn = 1e5 + 5;
int w[maxn];

int tr[maxn];
int lowbit(int x) { return x&(-x); }
void update(int x, int k) {
  while (x < maxn) tr[x] += k, x += lowbit(x);
}
int query(int x) {
  int res = 0;
  while (x) res += tr[x], x -= lowbit(x);
  return res;
}

int main()
{
  int n; cin >> n;
  for (int i = 1; i <= n; ++i) cin >> w[i], ys.push_back(w[i]);
  sort(ys.begin(), ys.end()), ys.erase(unique(ys.begin(), ys.end()), ys.end());

  for (int i = 1; i <= n; ++i) {
    int u = yFind(w[i]) + 1;
    update(u, 1);
    if (i & 1) {
      int l = 1, r = 1e5 + 2;
      while (l <= r) {
        int mid = (l + r) / 2;
```

```
        if (query(mid) >= (i+1)/2) r = mid-1;
        else l = mid+1;
      }
      cout << ys[l-1] << endl;
    }
  }
  return 0;
}
```

```
// 在树状数组上二分
// 时间复杂度: nlogn
#include <bits/stdc++.h>

using namespace std;

vector<int> ys;
int yFind(int x) { return lower_bound(ys.begin(), ys.end(), x) - ys.begin(); }

const int maxn = 1e5 + 5;
int w[maxn];

int tr[maxn];
int lowbit(int x) { return x&(-x); }
void update(int x, int k) {
  while (x < maxn) tr[x] += k, x += lowbit(x);
}
int query(int x) {
  int res = 0;
  while (x) res += tr[x], x -= lowbit(x);
  return res;
}

int main()
{
  int n; cin >> n;
  for (int i = 1; i <= n; ++i) cin >> w[i], ys.push_back(w[i]);
  sort(ys.begin(), ys.end()), ys.erase(unique(ys.begin(), ys.end()), ys.end());

  for (int i = 1; i <= n; ++i) {
    int u = yFind(w[i]) + 1;
    update(u, 1);
    if (i & 1) {
      int x = 0, sum = 0;
      for (int j = 16; j >= 0; --j) {
        if (x+(1<<j)<maxn && sum+tr[x+(1<<j)]<(i+1)/2) x += (1<<j), sum += tr[x];
      }
      cout << ys[x] << endl;
    }
  }
  return 0;
}
```

P4513 小白逛公园

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

using namespace std;

const int maxn = 5e5 + 5;
int w[maxn];
struct node {
    int l, r;
    int ms, ls, rs, sum;
} tr[maxn*4];

void pushup(node& uu, const node& ll, const node& rr) {
    uu.ms = max(max(ll.ms,rr.ms), ll.rs+rr.ls);
    uu.ls = max(ll.ls, ll.sum + rr.ls);
    uu.rs = max(rr.rs, rr.sum + ll.rs);
    uu.sum = ll.sum + rr.sum;
}

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

void build(int u, int l, int r) {
    tr[u] = {l, r, 0, 0, 0, 0};
    if (l == r) {
        tr[u].ms = tr[u].ls = tr[u].rs = 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 p, int k) {
    if (tr[u].l==p && tr[u].r==p) {
        tr[u].ms = tr[u].ls = tr[u].rs = tr[u].sum = k; return;
    }

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

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

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

    node uu, ll = query(u*2, l, r), rr = query(u*2+1, l, r);
```

```
    pushup(uu, ll, rr);
    return uu;
}

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; cin >> l >> r; if (l > r) swap(l, r);
            cout << query(1,l,r).ms << endl;
        } else {
            int p, k; cin >> p >> k; modify(1, p, k);
        }
    }
    return 0;
}
```