

# 综合练习

## 人员

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## 上周作业检查

上周作业链接: <https://cppoj.kids123code.com/contest/845>

2025-0921 周日8:30 (ST表)									
#	用户名	姓名	编程分	时间	A	B	C	D	E
1	yangjunyan	杨俊彦	500	12603	100	100	100	100	100
2	yuanchenjun	袁晨峻	400	6291	100	100	100	100	
3	liuyichen	刘奕辰	400	10907	100	100	100	100	0
4	yangyongcheng	杨咏丞	400	10997	100	100	100	100	
5	lijinshu	李锦澍	300	4119	100	100	100		
6	zhouzhirun	周治润	215	2212	100	100	15		
7	liyuan	李雨谦	200	1939	100	100	0		
8	suitianyi	隋天乙	200	2782	100	100	0		

## 本周作业

<https://cppoj.kids123code.com/contest/966> (课上讲了 A ~ C 题, 课后作业是 D 题)

## 课堂表现

今天的 A 题是一道裸的搜索题, 就是做两遍 搜索 找最远点, 同学们课上做 A 题整体都做的不太好, 课下要好好复习一下搜索的题目, 把之前的搜索题可以再做一做。

## 课堂内容

### [USACO07JAN] Balanced Lineup G (上周作业)

ST 表模板, 用 区间最大值 减去 区间最小值

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

using namespace std;

const int N = 5e4 + 5, M = 20;
int w[N], f1[N][M], f2[N][M], _lg2[N];

int get(int l, int r, bool flag) {
    int len = r - l + 1;
    int k = _lg2[len];
    if (flag) return max(f1[l][k], f1[r-(1<<k)+1][k]);
}
```

```

    return min(f2[l][k], f2[r-(1<<k)+1][k]);
}

int main()
{
    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) cin >> w[i], f1[i][0] = f2[i][0] = w[i];
    for (int k = 1; k < M; ++k) {
        for (int i = 1; i+(1<<k)-1 <= n; ++i) {
            f1[i][k] = max(f1[i][k-1], f1[i+(1<<(k-1))][k-1]);
            f2[i][k] = min(f2[i][k-1], f2[i+(1<<(k-1))][k-1]);
        }
    }

    while (m -- ) {
        int l, r; cin >> l >> r;
        cout << get(l,r,true) - get(l,r,false) << endl;
    }
    return 0;
}

```

### [蓝桥杯 2013 省 A] 大臣的旅费

两次搜索, 求树的带权直径

先从任意一点出发, 找到离他最远的点, 从这个点出发再搜一遍

```

#include <bits/stdc++.h>

using namespace std;

typedef long long LL;
const int maxn = 1e5 + 5;
struct node {
    int to, value;
};
vector<node> vec[maxn];
int dis[maxn];

void bfs(int x) {
    memset(dis, -1, sizeof(dis));

    queue<int> q; q.push(x); dis[x] = 0;
    while (!q.empty()) {
        int u = q.front(); q.pop();
        for (node it : vec[u]) {

```

```

        if (dis[it.to] != -1) continue;
        q.push(it.to), dis[it.to] = dis[u]+it.value;
    }
}
}

int main()
{
    int n; cin >> n;
    for (int i = 1; i <= n-1; ++i) {
        int a, b, c; cin >> a >> b >> c;
        vec[a].push_back({b,c}), vec[b].push_back({a,c});
    }

    bfs(1);

    int id = 1;
    for (int i = 2; i <= n; ++i) {
        if (dis[i] > dis[id]) id = i;
    }

    bfs(id);

    int res = 0;
    for (int i = 1; i <= n; ++i) res = max(res, dis[i]);

    cout << res*10 + (LL)res*(res+1)/2 << endl;
    return 0;
}

```

## [JRKSJ R1] JFCA

用 ST 表维护区间最大的 a 值

破环成链, 把数组拷贝 3 份, 针对中间这一份数组, 向左或向右进行二分, 找到最近的符合要求的点 j

```

#include <bits/stdc++.h>

using namespace std;

const int N = 1e5 + 5, M = 20;
const int inf = 0x3f3f3f3f;
int a[3*N], b[3*N], f[3*N][M], _lg2[3*N];

int get_max(int l, int r) {
    int k = _lg2[r-l+1];
    return max(f[l][k], f[r-(1<<k)+1][k]);
}

int main()
{

```

```

for (int i = 0; (1<<i) < 3*N; ++i) _lg2[1<<i] = i;
for (int i = 1; i < 3*N; ++i) {
    if (!_lg2[i]) _lg2[i] = _lg2[i-1];
}

int n; cin >> n;
for (int i = 1; i <= n; ++i) cin >> a[i], a[i+2*n] = a[i+n] = a[i];
for (int i = 1; i <= n; ++i) cin >> b[i], b[i+2*n] = b[i+n] = b[i];

for (int i = 1; i <= 3*n; ++i) f[i][0] = a[i];
for (int k = 1; k < M; ++k) {
    for (int i = 1; i+(1<<k)-1 <= 3*n; ++i) {
        f[i][k] = max(f[i][k-1], f[i+(1<<(k-1))][k-1]);
    }
}

for (int i = n+1; i <= n+n; ++i) {
    int lLen = inf, rLen = inf;
    if (get_max(i-n+1,i-1) >= b[i]) {
        int l = i-n+1, r = i-1;
        while (l <= r) {
            int mid = (l + r) / 2;
            if (get_max(mid,i-1) >= b[i]) l = mid+1;
            else r = mid-1;
        }
        lLen = i - r;
    }

    if (get_max(i+1, i+n-1) >= b[i]) {
        int l = i+1, r = i+n-1;
        while (l <= r) {
            int mid = (l + r) / 2;
            if (get_max(i+1,mid) >= b[i]) r = mid-1;
            else l = mid+1;
        }
        rLen = l - i;
    }

    int res = min(lLen, rLen);
    cout << (res==inf ? -1 : res) << " ";
}
cout << endl;
return 0;
}

```

## NAND repeatedly

线性 dp

$f[i][0]$  代表以第  $i$  项结尾时有多少 0,  $f[i][1]$  代表以第  $i$  项结尾时有多少 1

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

using namespace std;

typedef long long LL;
const int maxn = 1e6 + 5;
char s[maxn];
LL f[maxn][2];

int main()
{
    int n; cin >> n >> (s+1);

    LL res = 0;
    for (int i = 1; i <= n; ++i) {
        if (s[i] == '0') {
            f[i][0] = 1, f[i][1] = f[i-1][0] + f[i-1][1];
        } else {
            f[i][0] = f[i-1][1], f[i][1] = f[i-1][0]+1;
        }
        res += f[i][1];
    }
    cout << res << endl;
    return 0;
}
```