

CS150

初赛专题 集训



CS150 初赛专题集训公布资料的固定网站
请每次课前自行将资料下载到电脑

<https://pan.baidu.com/s/12ZsJgSE-p17Vxl-ObMe7Mg>

快快编程地址

<http://120.132.18.213:9062>

请登陆网站提交作业

循环+数组

数组的处理

遇到数组时， 要分析数组在程序中的作用。

存储输入数据， 数组中的数值一般不变。

保存程序结果， 数组中数值在程序运行过程中改变。

201303

```
#include <iostream>
using namespace std;
int main() {
    const int SIZE = 100;
    int n, f, i, left, right, middle, a[SIZE];
    cin>>n>>f;
    for (i = 1; i <= n; i++)
        cin>>a[i];
    left = 1;
    right = n;
    do {
        middle = (left + right) / 2;
        if (f <= a[middle])
            right = middle;
        else
            left = middle + 1;
    } while (left < right);
    cout<<left<<endl;
    return 0;
}
```

输出:

输入: 12 17
2 4 6 9 11 15 17 18 19 20 21 25

n	f	left	right	a[1]	a[2]	a[3]	a[4]	a[5]	a[6]	a[7]	a[8]	a[9]	a[10]	a[11]	a[12]
12	17	1	12	2	4	6	9	11	15	17	18	19	20	21	25

n	数组中元素的个数
left	指定数组最左边的元素下标
right	指定数组最右边的元素下标
middle	指定数组中间元素的下标

循环轮次	middle	a[middle]	left	right
1	6	15	7	12
2	9	19	7	9
3	8	18	7	8
4	7	17	7	7

猜测程序的作用

阅读程序是一些常见问题和经典算法的实现，如果对代码熟悉度高，可以看出程序的作用。

在平时的学习和阅读程序训练中注意积累代码，形成自己的认知范式。

201303

```
#include <iostream>
using namespace std;
int main() {
    const int SIZE = 100;
    int n, f, i, left, right, middle, a[SIZE];
    cin>>n>>f;
    for (i = 1; i <= n; i++)
        cin>>a[i];
    left = 1;
    right = n;
    do {
        middle = (left + right) / 2;
        if (f <= a[middle])
            right = middle;
        else
            left = middle + 1;
    } while (left < right);
    cout<<left<<endl;
    return 0;
}
```

猜测程序的作用?

二分查找


```
#include<iostream>
using namespace std;
const int SIZE = 100;
int main() {
    int p[SIZE];
    int n, tot, i, cn;
    tot = 0;
    cin >> n;
    for (i = 1; i <= n; i++)
        p[i] = 1;
    for (i = 2; i <= n; i++) {
        if (p[i] == 1)
            tot++;
        cn = i * 2;
        while (cn <= n) {
            p[cn] = 0;
            cn += i;
        }
    }
    cout << tot << endl;
    return 0;
}
```

输入: 30

输出:

填写数组元素

[illegible]

```
#include<iostream>
using namespace std;
const int SIZE = 100;
int main() {
    int p[SIZE];
    int n, tot, i, cn;
    tot = 0;
    cin >> n;
    for (i = 1; i <= n; i++)
        p[i] = 1;
    for (i = 2; i <= n; i++) {
        if (p[i] == 1)
            tot++;
        cn = i * 2;
        while (cn <= n) {
            p[cn] = 0;
            cn += i;
        }
    }
    cout << tot << endl;
    return 0;
}
```

猜测程序的作用?

统计

201603

```
#include <iostream>
using namespace std;
int main() {
    int a[6] = {1, 2, 3, 4, 5, 6};
    int pi = 0;
    int pj = 5;
    int t , i;
    while (pi < pj) {
        t = a[pi];
        a[pi] = a[pj];
        a[pj] = t;
        pi++;
        pj--;
    }
    for (i = 0; i < 6; i++)
        cout << a[i] << ", ";
    cout << endl;
    return 0;
}
```

输出:

201603

```
#include <iostream>
using namespace std;
```

数组a的作用, 保存6个整数

```
int main() {
```

```
    int a[6] = {1, 2, 3, 4, 5, 6};
```

```
    int pi = 0;
```

```
    int pj = 5;
```

pi, pj的作用, 指向数组中的位置, 类似指针
pi=0指向数组第一个元素, pj=5指向最后一个元素

```
    int t, i;
```

```
    while (pi < pj) {
```

循环条件pi<pj说明pi跟pj还没有相遇

```
        t = a[pi];
```

```
        a[pi] = a[pj];
```

```
        a[pj] = t;
```

交换两个变量的值, 看清具体哪两个变量

```
        pi++;
```

```
        pj--;
```

pi增大1, pj减小1, 从数组两端向中间移动

```
    }
```

```
    for (i = 0; i < 6; i++)
```

```
        cout << a[i] << ", ";
```

```
    cout << endl;
```

```
    return 0;
```

猜测程序的作用?

翻转数组元素

```
}
```

201304

```
#include <iostream>
using namespace std;
int main() {
    const int SIZE = 100;
    int height[SIZE], num[SIZE], n, ans;
    cin>>n;
    for (int i = 0; i < n; i++) {
        cin>>height[i];
        num[i] = 1;
        for (int j = 0; j < i; j++) {
            if ((height[j] < height[i]) && (num[j] >= num[i]))
                num[i] = num[j]+1;
        }
    }
    ans = 0;
    for (int i = 0; i < n; i++) {
        if (num[i] > ans) ans = num[i];
    }
    cout<<ans<<endl;
}
```

输入: 6

2 5 3 11 12 4

输出:

201304

```
#include <iostream>
using namespace std;
```

记录数据，数据表示高度

```
int main() {
```

```
    const int SIZE = 100;
```

记录数量，跟height长度相同

```
    int height[SIZE], num[SIZE], n, ans;
```

```
    cin>>n;
```

```
    for (int i = 0; i < n; i++) {
```

```
        cin>>height[i];
```

每一项初始化为1

```
        num[i] = 1;
```

```
        for (int j = 0; j < i; j++) {
```

$j < i$ 表示循环数组中 i 之前的元素

```
            if ((height[j] < height[i]) && (num[j] >= num[i]))
```

```
                num[i] = num[j]+1;
```

第 i 项的高度大于第 i 项前某一项，并且
 $num[j]$ 中的数量不少于 $num[i]$ 中的数量

```
        }
```

思考这一句

```
    }
```

```
    ans = 0;
```

```
    for (int i = 0; i < n; i++) {
```

```
        if (num[i] > ans) ans = num[i];
```

找数组中的最大值

```
    }
```

```
    cout<<ans<<endl;
```

猜测程序的作用?

最长上升子序列长度

字符串

201003

```
#include<iostream>
#include<string>
using namespace std;
int main() {
    string s;
    char m1,m2;
    int i;
    getline(cin,s);
    m1=' ';
    m2=' ';
    for(i=0;i<s.length();i++)
        if(s[i]>m1)
        {
            m2=m1;
            m1=s[i];
        }
        else if(s[i]>m2)
            m2=s[i];
    cout<<int(m1)<<' '<<int(m2)<<endl;
    return 0;
}
```

输入: Expo 2010 Shanghai China

输出:

字符	空格	'0'	'A'	'a'
ASCII码	32	48	65	97

201003

```
#include<iostream>
#include<string>
using namespace std;
int main() {
    string s;
    char m1,m2;
    int i;
    getline(cin,s);
    m1=' ';
    m2=' ';
    for(i=0;i<s.length();i++)
        if(s[i]>m1)
        {
            m2=m1;
            m1=s[i];
        }
        else if(s[i]>m2)
            m2=s[i];
    cout<<int(m1)<<' '<<int(m2)<<endl;
    return 0;
}
```

程序作用?

m1表示s中最大值, m2表示s中第二大值

字符	空格	'0'	'A'	'a'
ASCII码	32	48	65	97

201102

```
#include <iostream>
#include <string>
using namespace std;
int main() {
    string map = "22233344455566677778889999";
    string tel;
    int i;
    cin >> tel;
    for(i = 0; i < tel.length(); i++)
        if((tel[i] >= '0') && (tel[i] <= '9'))
            cout << tel[i];
        else if((tel[i] >= 'A') && (tel[i] <= 'Z'))
            cout << map[tel[i] - 'A'];
    cout << endl;
    return 0;
}
```

输入：CCF-NOIP-2011

输出：

201102

```
#include <iostream>
#include <string>
using namespace std;
int main() {
    string map = "22233344455566677778889999";
    string tel;
    int i;
    cin >> tel;
    for(i = 0; i < tel.length(); i++)
        if((tel[i] >= '0') && (tel[i] <= '9'))
            cout << tel[i];
        else if((tel[i] >= 'A') && (tel[i] <= 'Z'))
            cout << map[tel[i] - 'A'];
    cout << endl;
    return 0;
}
```

map长度为26, 联想到什么?

程序作用?

201403

```
#include<iostream>
#include<string>
using namespace std;
int main() {
    string st;
    int i, len;
    getline(cin, st);
    len = st.size();
    for (i=0; i < len; i++) {
        if (st[i] >= 'a' && st[i] <= 'z')
            st[i] = st[i] - 'a' + 'A';
    }
    cout << st << endl;
    return 0;
}
```

输入: Hello, my name is Lostmonkey.

输出:

201403

```
#include<iostream>
#include<string>
using namespace std;
int main() {
    string st;
    int i, len;
    getline(cin, st);
    len = st.size();
    for (i=0; i < len; i++) {
        if (st[i] >= 'a' && st[i] <= 'z')
            st[i] = st[i] - 'a' + 'A';
    }
    cout << st << endl;
    return 0;
}
```

程序作用?

输入: Hello, my name is Lostmonkey.

输出:

201503

```
#include <iostream>
#include <string>
using namespace std;
int main() {
    string str;
    int i;
    int count;
    count = 0;
    getline(cin, str);
    for (i = 0; i < str.length(); i++) {
        if(str[i] >= 'a' && str[i] <= 'z')
            count++;
    }
    cout << "It has " << count << " lowercases" << endl;
    return 0;
}
```

输入: NOI2016 will be held in Mian Yang.

输出:

201503

```
#include <iostream>
#include <string>
using namespace std;
int main() {
    string str;
    int i;
    int count;
    count = 0;
    getline(cin, str);
    for (i = 0; i < str.length(); i++) {
        if(str[i] >= 'a' && str[i] <= 'z')
            count++;
    }
    cout << "It has " << count << " lowercases" << endl;
    return 0;
}
```

程序作用?

输入: NOI2016 will be held in Mian Yang.

输出:

201604

```
#include <iostream>
using namespace std;
int main() {
    int i, length1, length2;
    string s1, s2;
    s1 = "I have a dream.";
    s2 = "I Have A Dream.";
    length1 = s1.size();
    length2 = s2.size();
    for (i = 0; i < length1; i++)
        if (s1[i] >= 'a' && s1[i] <= 'z')
            s1[i] -= 'a' - 'A';
    for (i = 0; i < length2; i++)
        if (s2[i] >= 'a' && s2[i] <= 'z')
            s2[i] -= 'a' - 'A';
    if (s1 == s2)
        cout << "=" << endl;
    else if (s1 > s2)
        cout << ">" << endl;
    else
        cout << "<" << endl;
    return 0;
}
```

输出:

201604

```
#include <iostream>
using namespace std;
int main() {
    int i, length1, length2;
    string s1, s2;
    s1 = "I have a dream.";
    s2 = "I Have A Dream.";
    length1 = s1.size();
    length2 = s2.size();
    for (i = 0; i < length1; i++)
        if (s1[i] >= 'a' && s1[i] <= 'z')
            s1[i] -= 'a' - 'A';
    for (i = 0; i < length2; i++)
        if (s2[i] >= 'a' && s2[i] <= 'z')
            s2[i] -= 'a' - 'A';
    if (s1 == s2)
        cout << "=" << endl;
    else if (s1 > s2)
        cout << ">" << endl;
    else
        cout << "<" << endl;
    return 0;
}
```

程序作用?

输出:

201701

```
#include<iostream>
using namespace std;
int main() {
    int t[256];
    string s;
    int i;
    cin>>s;
    for (i = 0; i < 256; i++)
        t[i] = 0;
    for(i = 0; i < s.length(); i++)
        t[s[i]]++;
    for (i = 0; i < s.length(); i++)
        if (t[s[i]]== 1) {
            cout << s[i] << endl;
            return 0;
        }
    cout<< "no" << endl;
    return 0;
}
```

输入: xyzxyw

输出:

201701

```
#include<iostream>
using namespace std;
int main() {
    int t[256];
    string s;
    int i;
    cin>>s;
    for (i = 0; i < 256; i++)
        t[i] = 0;
    for(i = 0; i < s.length(); i++)
        t[s[i]]++;
    for (i = 0; i < s.length(); i++)
        if (t[s[i]]== 1) {
            cout << s[i] << endl;
            return 0;
        }
    cout<< "no" << endl;
    return 0;
}
```

输入: xyzxyw

输出:

程序作用?

作业

阅读程序写结果严禁手工录入程序，运行计算结果。要自己模拟比赛环境，利用草稿纸手算结果。

请将作业打印（如有条件）或在电脑上使用文本文件填写，老师上课前1天发答案，家长按照答案批改督促。

写清楚你认为的程序作用。如果无法理解程序，请标注“不确定”。

请在老师发答案前独立完成！