

Assignment #7: 贪心和DP

Updated 0919 GMT+8 Oct 24, 2023

2023 fall, Compiled by ==苏王捷 工学院==

说明:

1) 请把每个题目解题思路 (可选), 源码Python, 或者C++/C (已经在Codeforces/Openjudge上AC), 截图 (包含Accepted, 学号), 填写到下面作业模版中 (推荐使用 typora <https://typoraio.cn>, 或者用word)。AC 或者没有AC, 都请标上每个题目大致花费时间。

3) 提交时候先提交pdf文件, 再把md或者doc文件上传到右侧“作业评论”。Canvas需要有同学清晰头像、提交文件有pdf、作业评论有md或者doc。

4) 如果不能在截止前提交作业, 请写明原因。

另外, CF的题目, 在洛谷有中文翻译, 例如 <https://www.luogu.com.cn/problem/CF1764C>

编程环境

操作系统: Windows 11

Python编程环境: Spyder IDE 5.4.3 | Python 3.11.4 64-bit

1. 必做题目

158B. Taxi

*special problem, greedy, implementation, 1100


<https://codeforces.com/problemset/problem/158/B>

思路: 贪心个, 尽可能多的安排人进车, 和装箱一个道理

代码

```
# n=int(input())
l=[int(i) for i in input().split()]
print(l.count(4)+l.count(3)+(l.count(2)*2+max(0,l.count(1)-l.count(3))+3)//4)
```

代码运行截图 == (至少包含有"Accepted") ==

General									
#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged	
223052743	Practice: csxq	158B - 10	Python 3	Accepted	124 ms	2492 KB	2023-09-12 11:07:45	2023-09-12 11:07:45	 <button>Compare</button>

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```

n=int(input())
l=[int(i) for i in input().split()]
print(l.count(4)-l.count(3)+l.count(2)*2-max(0,l.count(1)-l.count(3)-3)-4)

```

545D. Queue

greedy, implementation, sortings, 1300

<https://codeforces.com/problemset/problem/545/D>

思路：能排就排，不能就去

代码

```

# # -*- coding: utf-8 -*-
"""
Created on Tue Oct 24 10:06:20 2023

@author: Lenovo
"""

n=int(input())
l=[int(i) for i in input().split()]
l.sort()
num,t=0,0
for i in l:
    if i>=t:
        num+=1
        t+=i
print(num)

```

代码运行截图 == (至少包含有"Accepted") ==

By csxq, contest: Codeforces Round 303 (Div. 2), problem: (D) Queue, **Accepted**, <#>, [Copy](#)

```
# -*- coding: utf-8 -*-  
"""
```

Created on Tue Oct 24 10:06:20 2023

```
@author: Lenovo  
"""
```

```
n=int(input())  
l=[int(i) for i in input().split()]  
l.sort()  
num,t=0,0  
for i in l:  
    if i>=t:  
        num+=1  
        t+=i  
print(num)
```

803A. Maximal Binary Matrix

constructive algorithms, 1400

<https://codeforces.com/problemset/problem/803/A>

思路：贪心建矩阵，一个个添加

代码

```
# # -*- coding: utf-8 -*-  
"""  
Created on Tue Oct 24 10:23:52 2023  
  
@author: Lenovo  
"""  
  
def check(k):  
    if k>1:  
        return True  
    return False  
  
n,k=map(int,input().split())  
matrix=[["0"]*n for _ in range(n)]  
if n*n<k:  
    print(-1)  
else:  
    m=0  
    while check(k):  
        matrix[m][m]="1"  
        k-=1  
        i=m+1  
        while check(k) and i<n:  
            matrix[i][m]="1"
```

```

        martix[m][i]="1"
        k-=2
        i+=1
    m+=1
if k==1:
    martix[m][m]="1"
for l in martix:
    print(" ".join(l))

```

代码运行截图

By csxq, contest: Educational Codeforces Round 20, problem: (A) Maximal Binary Matrix, **Accepted**, #, [Copy](#)

```
# -*- coding: utf-8 -*-
"""
```

Created on Tue Oct 24 10:23:52 2023

```
@author: Lenovo
"""
```

```

def check(k):
    if k%1:
        return True
    return False

n,k=map(int,input().split())
martix=[["0"]*n for _ in range(n)]
if n*n<k:
    print(-1)
else:
    m=0
    while check(k):
        martix[m][m]="1"
        k-=1
        i=m+1
        while check(k) and i<n:
            martix[i][m]="1"
            martix[m][i]="1"
            k-=2
            i+=1
        m+=1
    if k==1:
        martix[m][m]="1"
    for l in martix:
        print(" ".join(l))

```

1793C. Dora and Search

constructive algorithms, data structures, two pointers, 1200,

<https://codeforces.com/problemset/problem/1793/C>

思路：类似田忌赛马

代码

```
# # -*- coding: utf-8 -*-
"""
Created on Tue Oct 24 10:50:31 2023

@author: Lenovo
"""

def check():
    n=int(input())
    l=[int(i) for i in input().split()]
    i,j,k,m=0,n-1,1,n
    while j-i>1:
        if l[i]==k:
            i+=1
            k+=1
        elif l[i]==m:
            i+=1
            m-=1
        elif l[j]==k:
            j-=1
            k+=1
        elif l[j]==m:
            j-=1
            m-=1
        else:
            return i+1,j+1
    return -1,-1

t=int(input())
for i in range(t):
    a1,a2=check()
    if a1==-1:
        print(-1)
    else:
        print(a1,a2)
```

代码运行截图

By csxq, contest: Codeforces Round 852 (Div. 2), problem: (C) Dora and Search, **Accepted**, #, [Copy](#)

```
# -*- coding: utf-8 -*-  
"""
```

Created on Tue Oct 24 10:50:31 2023

```
@author: Lenovo  
"""
```

```
def check():  
    n=int(input())  
    l=[int(i) for i in input().split()]  
    i,j,k,m=0,n-1,1,n  
    while j-i>1:  
        if l[i]==k:  
            i-=1  
            k-=1  
        elif l[i]==m:  
            i-=1  
            m-=1  
        elif l[j]==k:  
            j-=1  
            k-=1  
        elif l[j]==m:  
            j-=1  
            m-=1  
        else:  
            return i+1, j-1  
    return -1,-1  
  
t=int(input())  
for i in range(t):  
    a1,a2=check()  
    if a1==-1:  
        print(-1)  
    else:  
        print(a1,a2)
```

2. 选做题目

368B. Sereja and Suffixes

data structures/dp, 1100

<https://codeforces.com/problemset/problem/368/B>

思路：从尾部开始计算，用集合储存已经出现过的数字

代码

```
# # -*- coding: utf-8 -*-  
"""  
  
Created on Tue Oct 24 11:14:34 2023  
  
@author: Lenovo  
"""  
  
n,m=map(int,input().split())  
a=[int(i) for i in input().split()]
```

```

l=[]
for i in range(m):
    l.append(int(input())-1)
ans,s=[0]*(n+1),set()
for i in range(n-1,-1,-1):
    if a[i] not in s:
        s.add(a[i])
        ans[i]=ans[i+1]+1
    else:
        ans[i]=ans[i+1]
for i in l:
    print(ans[i])

```

代码运行截图

By csxq, contest: Codeforces Round 215 (Div. 2), problem: (B) Sereja and Suffixes, **Accepted**, <#>, [Copy](#)

```

# -*- coding: utf-8 -*-
"""
Created on Tue Oct 24 11:14:34 2023

@author: Lenovo
"""

n,m=map(int,input().split())
a=[int(i) for i in input().split()]
l=[]
for i in range(m):
    l.append(int(input())-1)
ans,s=[0]*(n+1),set()
for i in range(n-1,-1,-1):
    if a[i] not in s:
        s.add(a[i])
        ans[i]=ans[i+1]+1
    else:
        ans[i]=ans[i+1]
for i in l:
    print(ans[i])

```

1764C. Doremy's City Construction

graphs, greedy, 1400

<https://codeforces.com/problemset/problem/1764/C>

思路：至少两两相连，至多以某点为中心点发散

代码

```

# # -*- coding: utf-8 -*-
"""
Created on Tue Oct 24 11:54:46 2023

@author: Lenovo

```

```

"""
t=int(input())
for i in range(t):
    n=int(input())
    l=[int(_) for _ in input().split()]
    l.sort()
    ans=n//2
    for i in range(1,n):
        if l[i]!=l[i-1]:
            ans=max(ans,i*(n-i))
    print(ans)

```

代码运行截图

By csxq, contest: Codeforces Global Round 24, problem: (C) Doremy's City Construction, **Accepted**, [≡](#), [Copy](#)

```

# -*- coding: utf-8 -*-
"""
Created on Tue Oct 24 11:54:46 2023

@author: Lenovo
"""

t=int(input())
for i in range(t):
    n=int(input())
    l=[int(_) for _ in input().split()]
    l.sort()
    ans=n//2
    for i in range(1,n):
        if l[i]!=l[i-1]:
            ans=max(ans,i*(n-i))
    print(ans)

```

3. 学习总结和收获

==如果作业题目简单，有否额外练习题目，比如：OJ“每日选做”中每天推出的32题目、CF、LeetCode、洛谷等网站题目。==

每日选做练习，常用heapq，dfs和bfs题的训练还需加强，贪心题有时难以想到