Assignment #A: 矩阵和动态规划

Updated 1406 GMT+8 Nov 14, 2023

2023 fall, Complied by ==同学的姓名、院系==

说明：

1）请把每个题目解题思路（可选），源码Python, 或者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。

2）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。

3）如果不能在截止前提交作业，请写明原因。

编程环境

==（请改为同学的操作系统、编程环境等）==

操作系统：macOS Ventura 13.4.1 (c)

Python编程环境：Spyder IDE 5.2.2, PyCharm 2023.1.4 (Professional Edition)

C/C++编程环境：Mac terminal vi (version 9.0.1424), g++/gcc (Apple clang version 14.0.3, clang-1403.0.22.14.1)

1. 必做题目

OJ12558: 岛屿周长

matices, http://cs101.openjudge.cn/practice/12558/

思路：

代码

```
#
n,m=[int(i) for i in input().split()]
a=[]
for i in range(n):
    a.append([int(i) for i in input().split()])
sum=0
for i in range(n):
    for j in range(m):
        flag=0
        if(a[i][j]==1):
```

```
            if(i-1<0):
                flag+=1
            elif(a[i-1][j]==0):
                flag+=1
            if(i+1>n-1):
                flag+=1
            elif(a[i+1][j]==0):
                flag+=1

            if(j-1<0):
                flag+=1
            elif(a[i][j-1]==0):
                flag+=1
            if(j+1>m-1):
                flag+=1
            elif(a[i][j+1]==0):
                flag+=1

        sum+=flag
print(sum)
```

代码运行截图 ==（至少包含有"Accepted"）==

OJ02760: 数字三角形

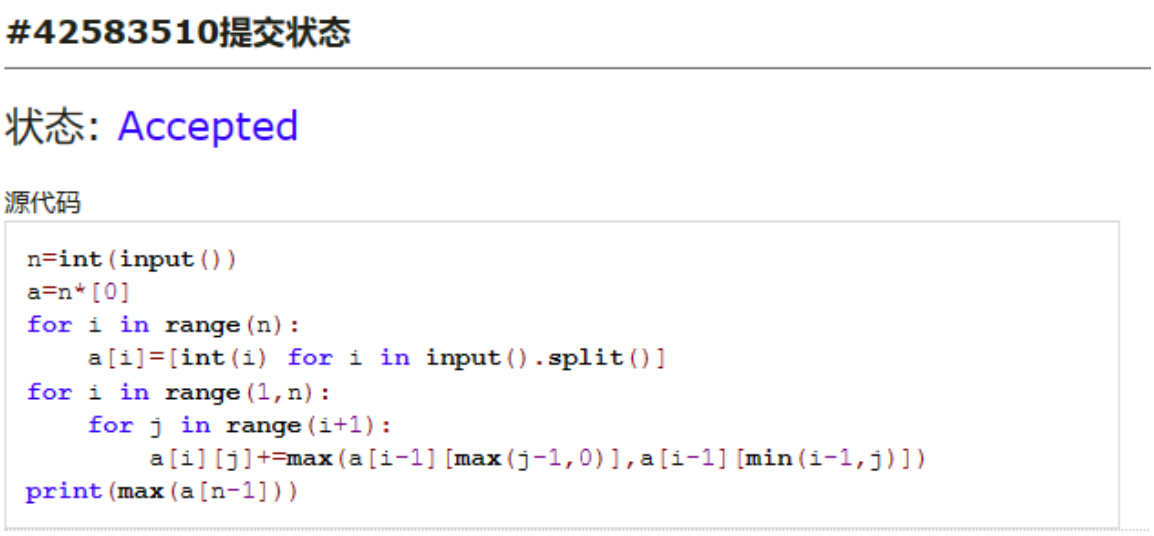
dp, http://cs101.openjudge.cn/practice/02760/

思路:

代码

```
#
n=int(input())
a=n*[0]
for i in range(n):
    a[i]=[int(i) for i in input().split()]
for i in range(1,n):
    for j in range(i+1):
        a[i][j]+=max(a[i-1][max(j-1,0)],a[i-1][min(i-1,j)])
print(max(a[n-1]))
```

代码运行截图 ==（至少包含有"Accepted"）==



OJ02773: 采药

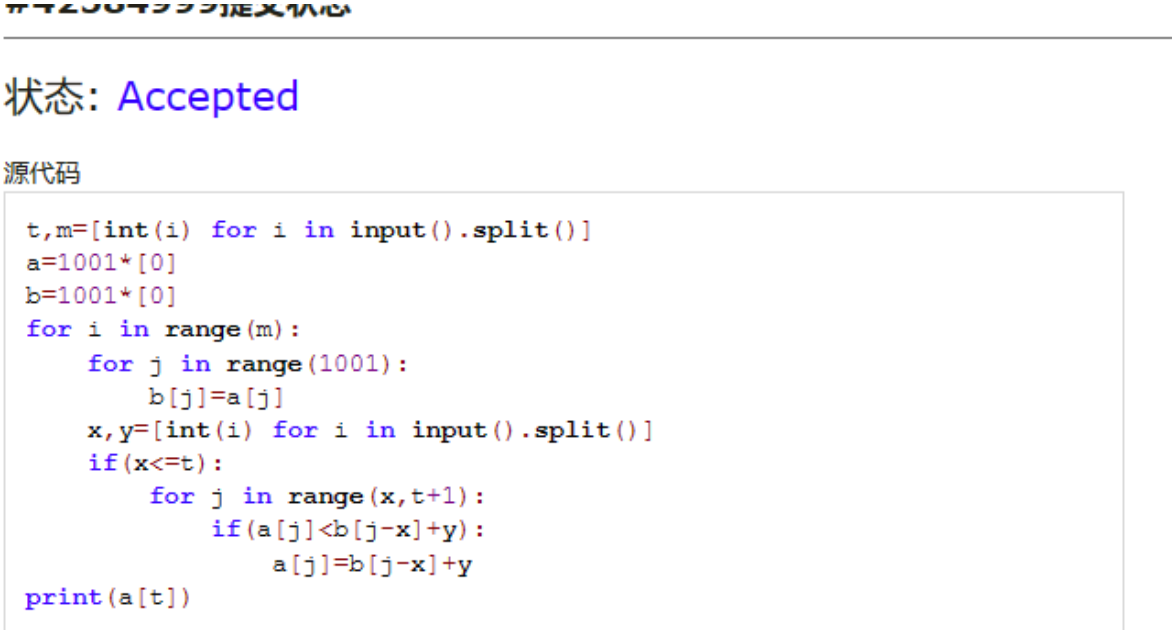
dp, http://cs101.openjudge.cn/practice/02773

思路:

代码

```
#
t,m=[int(i) for i in input().split()]
a=1001*[0]
b=1001*[0]
for i in range(m):
    for j in range(1001):
        b[j]=a[j]
    x,y=[int(i) for i in input().split()]
    if(x<=t):
        for j in range(x,t+1):
            if(a[j]<b[j-x]+y):
                a[j]=b[j-x]+y
print(a[t])
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



状态: Accepted

源代码

```
t,m=[int(i) for i in input().split()]
a=1001*[0]
b=1001*[0]
for i in range(m):
    for j in range(1001):
        b[j]=a[j]
    x,y=[int(i) for i in input().split()]
    if(x<=t):
        for j in range(x,t+1):
            if(a[j]<b[j-x]+y):
                a[j]=b[j-x]+y
print(a[t])
```

OJ18106: 螺旋矩阵

matrices, http://cs101.openjudge.cn/practice/18106/

这个题目技巧性较强，可以看题解记住。

思路：

代码

```
#
n=int(input())
a=[n*[0] for i in range(n)]
l=0
```

```
r=1
z1=0
z2=0
for i in range(1,n*n+1):
    if(z1+l>=0 and z1+l<n and z2+r>=0 and z2+r<n):
        if(a[z1+l][z2+r]==0):
            a[z1][z2]=str(i)
        else:
            a[z1][z2]=str(i)
            if(l==0 and r==1):
                l=1
                r=0
            elif(l==1 and r==0):
                l=0
                r=-1
            elif(l==0 and r==-1):
                l=-1
                r=0
            elif(l==-1 and r==0):
                l=0
                r=1
    else:
        a[z1][z2]=str(i)
        if(l==0 and r==1):
            l=1
            r=0
        elif(l==1 and r==0):
            l=0
            r=-1
        elif(l==0 and r==-1):
            l=-1
            r=0
        elif(l==-1 and r==0):
            l=0
            r=1
    z1+=l
    z2+=r
for i in range(n):
    print(' '.join(a[i]))
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

状态：Accepted

源代码

```
n=int(input())
a=[n*[0] for i in range(n)]
l=0
r=1
z1=0
z2=0
for i in range(1,n*n+1):
    if(z1+l>=0 and z1+l<n and z2+r>=0 and z2+r<n):
        if(a[z1+l][z2+r]==0):
            a[z1][z2]=str(i)
        else:
            a[z1][z2]=str(i)
            if(l==0 and r==1):
                l=1
                r=0
            elif(l==1 and r==0):
                l=0
                r=-1
            elif(l==0 and r==-1):
                l=-1
                r=0
            elif(l==-1 and r==0):
                l=0
                r=1
    else:
        a[z1][z2]=str(i)
        if(l==0 and r==1):
            l=1
            r=0
        elif(l==1 and r==0):
            l=0
            r=-1
        elif(l==0 and r==-1):
            l=-1
            r=0
        elif(l==-1 and r==0):
            l=0
            r=1
    z1+=l
    z2+=r
for i in range(n):
    print(' '.join(a[i]))
```

2. 选做题目

如果耗时太长，直接看解题思路，或者源码

CF189A: Cut Ribbon

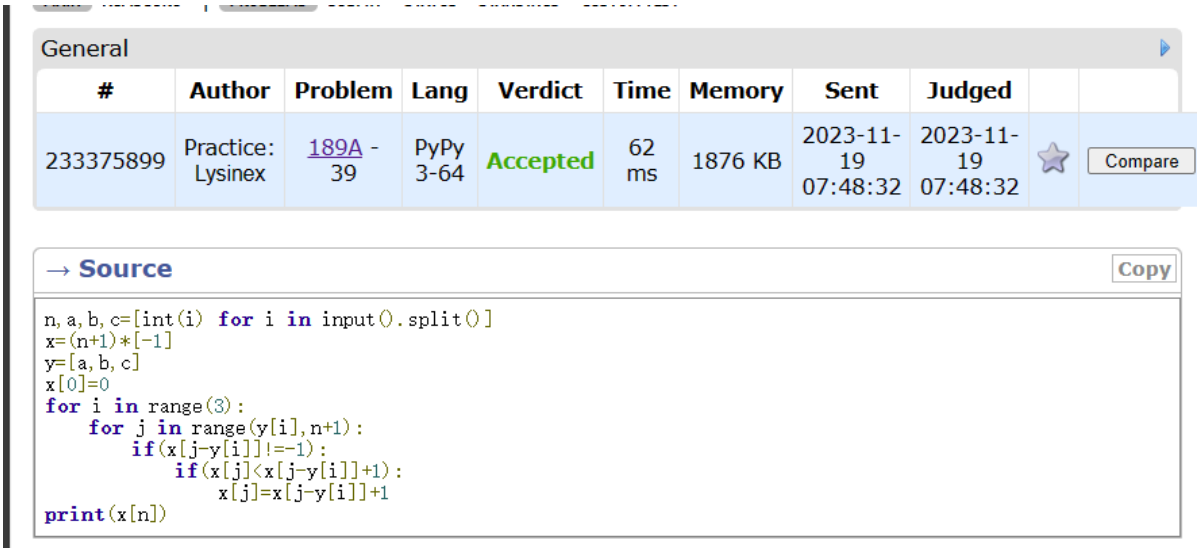
brute force/dp, 1300, https://codeforces.com/problemset/problem/189/A

思路：

代码

```
#
n,a,b,c=[int(i) for i in input().split()]
x=(n+1)*[-1]
y=[a,b,c]
x[0]=0
for i in range(3):
    for j in range(y[i],n+1):
        if(x[j-y[i]]!=-1):
            if(x[j]<x[j-y[i]]+1):
                x[j]=x[j-y[i]]+1
print(x[n])
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



General

#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged		
233375899	Practice: Lysinex	189A - 39	PyPy 3-64	Accepted	62 ms	1876 KB	2023-11-19 07:48:32	2023-11-19 07:48:32		Compare

→ Source Copy

```
n, a, b, c=[int(i) for i in input().split()]
x=(n+1)*[-1]
y=[a, b, c]
x[0]=0
for i in range(3):
    for j in range(y[i],n+1):
        if(x[j-y[i]]!=-1):
            if(x[j]<x[j-y[i]]+1):
                x[j]=x[j-y[i]]+1
print(x[n])
```

CF455A: Boredom

dp, 1500, https://codeforces.com/contest/455/problem/A

思路:

代码

```
#
n=int(input())
a=[int(i) for i in input().split()]
maxa=max(a)
b=(maxa+1)*[0]
for i in range(n):
    b[a[i]]+=1
c=(maxa+1)*[0]
```

```
c[1]=b[1]
for i in range(2,maxa+1):
    if(c[i-1]<c[i-2]+b[i]*i):
        c[i]=c[i-2]+b[i]*i
    else:
        c[i]=c[i-1]
print(c[maxa])
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

General

#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged		
233378973	Practice: Lysinex	455A - 35	PyPy 3-64	Accepted	77 ms	11356 KB	2023-11-19 08:37:55	2023-11-19 08:37:55		Compare

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```
n=int(input())
a=[int(i) for i in input().split()]
maxa=max(a)
b=(maxa+1)*[0]
for i in range(n):
    b[a[i]]+=1
c=(maxa+1)*[0]
c[1]=b[1]
for i in range(2,maxa+1):
    if(c[i-1]<c[i-2]+b[i]*i):
        c[i]=c[i-2]+b[i]*i
    else:
        c[i]=c[i-1]
print(c[maxa])
```

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2题目、CF、LeetCode、洛谷等网站题目。==

这周的练习感觉还算简单（又或者是我真的有进步哈哈哈），感觉都是算法的模版题居多。搞懂了算法就不是什么难事啦。

感觉这周学会了深搜和动态规划之后确实进步很大哦，作业没做多久就做完了哈哈 满满的成就感！