

# Assignment #A: 矩阵和动态规划

Updated 1406 GMT+8 Nov 14, 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++ (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: Windows 11

Python编程环境: Spyder IDE 5.4.5

## 1. 必做题目

### OJ12558: 岛屿周长

matrices, <http://cs101.openjudge.cn/practice/12558/>

思路: 周围几个0, 就加多少边长

## 代码

```
# # -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 14:58:26 2023

@author: Lenovo
"""

def count(x,y):
    ans=0
    dir=[[1,0],[-1,0],[0,1],[0,-1]]
    for i in range(4):
        dx,dy=x+dir[i][0],y+dir[i][1]
        if not martix[dx][dy]:
            ans+=1
```

```

    return ans
n,m=map(int,input().split())
martix,ans=[[0]*(m+2),[0]*(m+2)],0
for i in range(1,n+1):
    martix.insert(i,[0]+list(map(int,input().split()))+[0])
for i in range(1,n+1):
    for j in range(1,m+1):
        if martix[i][j]:
            ans+=count(i,j)
print(ans)

```

代码运行截图 == (至少包含有"Accepted") ==

#42477472提交状态

[查看](#) [提交](#) [统计](#) [提问](#)

状态: Accepted

源代码

```

# -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 14:58:26 2023

@author: Lenovo
"""

def count(x,y):
    ans=0
    dir=[[1,0],[-1,0],[0,1],[0,-1]]
    for i in range(4):
        dx,dy=x+dir[i][0],y+dir[i][1]
        if not martix[dx][dy]:
            ans+=1
    return ans
n,m=map(int,input().split())
martix,ans=[[0]*(m+2),[0]*(m+2)],0
for i in range(1,n+1):
    martix.insert(i,[0]+list(map(int,input().split()))+[0])
for i in range(1,n+1):
    for j in range(1,m+1):
        if martix[i][j]:
            ans+=count(i,j)
print(ans)

```

基本信息

#: 42477472

题目: 12558

提交人: 23n2300011075(才疏学浅)

内存: 4196kB

时间: 29ms

语言: Python3

提交时间: 2023-11-14 15:09:58

## OJ02760: 数字三角形

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

思路: dp做法, 把每个位置上可能的最大储存, 取第n层的最大值

代码

```

# # -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:11:13 2023

@author: Lenovo
"""

```

```

n=int(input())
delta=[[0]]
for i in range(n):
    delta.append([0]+list(map(int,input().split())))
dp=[[0]*(n+1) for i in range(n+1)]
for i in range(1,n+1):
    for j in range(1,i+1):
        dp[i][j]=max(dp[i-1][j],dp[i-1][j-1])+delta[i][j]
print(max(dp[n]))

```

代码运行截图 == (至少包含有"Accepted") ==

#42477750提交状态

[查看](#) [提交](#) [统计](#) [提问](#)

状态: Accepted

源代码

```

# -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:11:13 2023

@author: Lenovo
"""

n=int(input())
delta=[[0]]
for i in range(n):
    delta.append([0]+list(map(int,input().split())))
dp=[[0]*(n+1) for i in range(n+1)]
for i in range(1,n+1):
    for j in range(1,i+1):
        dp[i][j]=max(dp[i-1][j],dp[i-1][j-1])+delta[i][j]
print(max(dp[n]))

```

基本信息

#: 42477750  
 题目: 02760  
 提交人: 23n2300011075(才疏学浅)  
 内存: 3776kB  
 时间: 29ms  
 语言: Python3  
 提交时间: 2023-11-14 15:20:17

## OJ02773: 采药

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

思路: 对时间dp, 从后往前讨论某时刻所能取得的最大价值

代码

```

# # -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:22:35 2023

@author: Lenovo
"""

t,m=map(int,input().split())
l=[[0]]
for i in range(m):
    l.append(list(map(int,input().split())))
ans=[0]*(t+1)
for i in range(1,m+1):

```

```
for j in range(t,l[i][0]-1,-1):
    ans[j]=max(ans[j],ans[j-l[i][0]]+l[i][1])
print(ans[t])
```

代码运行截图 == (AC代码截图, 至少包含有"Accepted") ==

#42477961提交状态

[查看](#) [提交](#) [统计](#) [提问](#)

状态: Accepted

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:22:35 2023

@author: Lenovo
"""

t,m=map(int,input().split())
l=[[0]]
for i in range(m):
    l.append(list(map(int,input().split())))
ans=[0]*(t+1)
for i in range(1,m+1):
    for j in range(t,l[i][0]-1,-1):
        ans[j]=max(ans[j],ans[j-l[i][0]]+l[i][1])
print(ans[t])
```

基本信息

#: 42477961  
题目: 02773  
提交人: 23n2300011075(才疏学浅)  
内存: 3632kB  
时间: 65ms  
语言: Python3  
提交时间: 2023-11-14 15:27:05

## 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: 寻找拐点的不同条件并在拐点出对指针的运动方向改变

代码

```
# # -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:28:26 2023

@author: Lenovo
"""

n=int(input())
matrix=[[0]*n for i in range(n)]
cnt_x,cnt_y,dx,dy=0,0,1,0
cnt_n,cnt_s,cnt_e,cnt_w=0,n-1,n-1,0
for i in range(1,n*n+1):
    matrix[cnt_y][cnt_x]=str(i)
    cnt_x+=dx
    cnt_y+=dy
    if dx==1 and dy==0 and cnt_x==cnt_e and cnt_y==cnt_n:
        dx,dy=0,1
```

```

        cnt_n+=1
    elif dx==0 and dy==1 and cnt_x==cnt_e and cnt_y==cnt_s:
        dx,dy=-1,0
        cnt_e-=1
    elif dx==-1 and dy==0 and cnt_x==cnt_w and cnt_y==cnt_s:
        dx,dy=0,-1
        cnt_s-=1
    elif dx==0 and dy==-1 and cnt_x==cnt_w and cnt_y==cnt_n:
        dx,dy=1,0
        cnt_w+=1
for i in range(n):
    print(" ".join(martix[i]))

```

代码运行截图 == (AC代码截图, 至少包含有"Accepted") ==

#42479006提交状态

[查看](#) [提交](#) [统计](#) [提问](#)

状态: **Accepted**

源代码

```

# -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 15:28:26 2023

@author: Lenovo
"""

n=int(input())
martix=[[0]*n for i in range(n)]
cnt_x,cnt_y,dx,dy=0,0,1,0
cnt_n,cnt_s,cnt_e,cnt_w=0,n-1,n-1,0
for i in range(1,n*n+1):
    martix[cnt_y][cnt_x]=str(i)
    cnt_x+=dx
    cnt_y+=dy
    if dx==1 and dy==0 and cnt_x==cnt_e and cnt_y==cnt_n:
        dx,dy=0,1
        cnt_n+=1
    elif dx==0 and dy==1 and cnt_x==cnt_e and cnt_y==cnt_s:
        dx,dy=-1,0
        cnt_e-=1
    elif dx==-1 and dy==0 and cnt_x==cnt_w and cnt_y==cnt_s:
        dx,dy=0,-1
        cnt_s-=1
    elif dx==0 and dy==-1 and cnt_x==cnt_w and cnt_y==cnt_n:
        dx,dy=1,0
        cnt_w+=1
for i in range(n):
    print(" ".join(martix[i]))

```

基本信息

#: 42479006  
 题目: 18106  
 提交人: 23n2300011075(才疏学浅)  
 内存: 3664kB  
 时间: 28ms  
 语言: Python3  
 提交时间: 2023-11-14 16:10:50

## 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: dp, 寻找每个长度时能取到的最大数目并储存, 找到n长度时的最大值

## 代码

```
# # -*- coding: utf-8 -*-
"""
Created on Wed Nov 1 23:04:12 2023

@author: Lenovo
"""

n,a,b,c=map(int,input().split())
l=[a,b,c]
f=[0]*(n+1)
for i in range(n+1):
    if i!=0 and f[i]==0:
        continue
    for j in range(3):
        index=i+l[j]
        if index<=n:
            f[index]=max(f[index],f[i]+1)
print(f[n])
```

代码运行截图 == (AC代码截图, 至少包含有"Accepted") ==

PROBLEMS SUBMIT CODE MY SUBMISSIONS STATUS HACKS ROOM STANDINGS CUSTOM INVOCATION

General

#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged		
230847457	Practice: CSXQ	<a href="#">189A</a> - 39	Python 3	Accepted	46 ms	0 KB	2023-11-01 18:17:54	2023-11-01 18:17:55	☆	<a href="#">Compare</a>

→ Source Copy

```
# -*- coding: utf-8 -*-
"""
Created on Wed Nov 1 23:04:12 2023

@author: Lenovo
"""

n, a, b, c = map(int, input().split())
l = [a, b, c]
f = [0] * (n + 1)
for i in range(n + 1):
    if i != 0 and f[i] == 0:
        continue
    for j in range(3):
        index = i + l[j]
        if index <= n:
            f[index] = max(f[index], f[i] + 1)
print(f[n])
```

## CF455A: Boredom

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

思路：对每个不同的元素，有两种选择，保留一个当前元素的积分，但跳过前一个元素，或者保留前一个元素的积分，但跳过当前元素

，选择最大值并遍历

代码

```
# # -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 16:12:17 2023

@author: Lenovo
"""

n=int(input())
z=[0]*100001
for i in map(int,input().split()):
    z[i]+=i
a=b=0
for i in z:
    a,b=max(a,b+i),a
print(a)
```

代码运行截图 == (AC代码截图, 至少包含有"Accepted") ==

PROBLEMS SUBMIT CODE MY SUBMISSIONS STATUS HACKS ROOM STANDINGS CUSTOM INVOCATION

General

#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged		
232724170	Practice: csxq	455A - 35	Python 3	Accepted	108 ms	11488 KB	2023-11-14 11:59:38	2023-11-14 11:59:38	☆	Compare

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```
# -*- coding: utf-8 -*-
"""
Created on Tue Nov 14 16:12:17 2023

@author: Lenovo
"""

n=int(input())
z=[0]*100001
for i in map(int,input().split()):
    z[i]+=i
a=b=0
for i in z:
    a,b=max(a,b+i),a
print(a)
```

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。==

加深对线段树和树状数组的应用, 最近又有了字典树, 并查集, 网络流的知识, 这是否有点。。。?  
: )