

Assignment #3: March月考

Updated 1537 GMT+8 March 6, 2024

2024 spring, Compiled by 陈亚偲 工学院

说明:

1) The complete process to learn DSA from scratch can be broken into 4 parts:

- Learn about Time and Space complexities
- Learn the basics of individual Data Structures
- Learn the basics of Algorithms
- Practice Problems on DSA

2) 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），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”区有上传的md或者doc附件。

4) 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

Python编程环境: Spyder IDE 5.2.2

1. 题目

02945: 拦截导弹

<http://cs101.openjudge.cn/practice/02945/>

思路: 土制dp（上学期的dp忘的差不多了，最后倒是想出来了，最近补一下）

对不同拦截数目dp

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on wed Mar 6 17:26:58 2024

@author: 陈亚偲 2300011106
```

```

"""
#from collections import defaultdict
k=int(input())
#ans=defaultdict(int)
ans={}
ans[0]=9999
for i in range(1,k+1):
    ans[i]=-1
w=[int(i) for i in input().split()]
for i in w:
    for j in range(k-1,-1,-1):
        if ans[j]>=i and ans[j+1]<i:
            ans[j+1]=i
ct=-1
for i in range(k+1):
    if ans[i]!=-1:
        ct+=1
    else:
        break
print(ct)

```

代码运行截图 == (至少包含有"Accepted") ==

#44094114提交状态

状态: Accepted

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 17:26:58 2024

@author: 陈亚偲 2300011106
"""
from collections import defaultdict
k=int(input())
#ans=defaultdict(int)
ans={}
ans[0]=9999
for i in range(1,k+1):
    ans[i]=-1
w=[int(i) for i in input().split()]
for i in w:
    for j in range(k-1,-1,-1):
        if ans[j]>=i and ans[j+1]<i:
            ans[j+1]=i
ct=-1
for i in range(k+1):
    if ans[i]!=-1:
        ct+=1
    else:
        break
print(ct)
```

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04147:汉诺塔问题(Tower of Hanoi)

<http://cs101.openjudge.cn/practice/04147>

思路:

数字，路程分别递归，路程的递归可以当成元素的转换（当时没想明白，但是知道一定有一种排列可以ac，硬试出来了）

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on wed Mar  6 17:53:04 2024

@author: 陈亚偲 2300011106
"""
def boza(n):
    if n==1:
        return [1]
```

```

        else:
            return boza(n-1)+[n]+boza(n-1)
n,a,b,c=map(str,input().split())
n=int(n)
l1=boza(n)#the first number
tp=['accepted',a,b,c]
def ciza(n,a,b,c):
    x,y,z=a,b,c
    if n==1:
        return [a+'->'+c]
    else:
        if n%2==1:
            p=ciza(n-1,x,z,y)
            q=ciza(n-1,y,x,z)
            return p+[a+'->'+c]+q
        else:
            p=ciza(n-1,x,z,y)
            q=ciza(n-1,y,x,z)
            return p+[a+'->'+c]+q
l2=ciza(n,a,b,c)
for i in range((2**n)-1):
    print(str(l1[i])+':'+l2[i])

```

代码运行截图 == (至少包含有"Accepted") ==

状态: Accepted

主

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 17:53:04 2024

@author: 陈亚偲 2300011106
"""
def boza(n):
    if n==1:
        return [1]
    else:
        return boza(n-1)+[n]+boza(n-1)
n,a,b,c=map(str,input().split())
n=int(n)
l1=boza(n)#the first number
tp=['accepted',a,b,c]
def ciza(n,a,b,c):
    x,y,z=a,b,c
    if n==1:
        return [a+'->'+c]
    else:
        if n%2==1:
            p=ciza(n-1,x,z,y)
            q=ciza(n-1,y,x,z)
            return p+[a+'->'+c]+q
        else:
            p=ciza(n-1,x,z,y)
            q=ciza(n-1,y,x,z)
            return p+[a+'->'+c]+q
l2=ciza(n,a,b,c)
for i in range((2**n)-1):
    print(str(l1[i])+' '+l2[i])
```

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03253: 约瑟夫问题No.2

<http://cs101.openjudge.cn/practice/03253>

思路:

和猴子思路完全一致，这一次把编号记下来

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 22:26:02 2024

@author: 陈亚偲 2300011106
```

```

"""
while True:
    n,p,m=map(int,input().split())
    if n==0:
        break
    ans=[]
    og=[i for i in range(n)]
    boza=og[p-1:]+og[:p-1]
    for i in range(n):
        k=(m-1)%len(boza)
        ans.append(str(boza[k]+1))
        boza=boza[k+1:]+boza[:k]
    print(' '.join(ans))

```

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

#44098892提交状态

状态: Accepted

源代码

```

# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 22:26:02 2024

@author: 陈亚德 2300011106
"""
while True:
    n,p,m=map(int,input().split())
    if n==0:
        break
    ans=[]
    og=[i for i in range(n)]
    boza=og[p-1:]+og[:p-1]
    for i in range(n):
        k=(m-1)%len(boza)
        ans.append(str(boza[k]+1))
        boza=boza[k+1:]+boza[:k]
    print(' '.join(ans))

```

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21554:排队做实验 (greedy)v0.2

<http://cs101.openjudge.cn/practice/21554>

思路:

快的先做, 用format (比round好用)

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 22:28:36 2024

@author: 陈亚偲 2300011106
"""
m=int(input())
dt={}
lt=[int(i) for i in input().split()]
for i in range(m):
    dt[i+1]=lt[i]
boza = sorted(dt, key=lambda x: dt[x])
print(*boza)
ct=0
for i in range(m):
    ct+=(m-i-1)*dt[boza[i]]
print('{:.2f}'.format(ct/m))
```

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

#44099107提交状态

状态: Accepted

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 22:28:36 2024

@author: 陈亚偲 2300011106
"""
m=int(input())
dt={}
lt=[int(i) for i in input().split()]
for i in range(m):
    dt[i+1]=lt[i]
boza = sorted(dt, key=lambda x: dt[x])
print(*boza)
ct=0
for i in range(m):
    ct+=(m-i-1)*dt[boza[i]]
print('{:.2f}'.format(ct/m))
```

19963:买学区房

<http://cs101.openjudge.cn/practice/19963>

思路:

直接都算出来，然后按规定数即可

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on Sat Dec 9 16:52:53 2023

@author: 陈亚偲2300011106
"""
ct=0
n=int(input())
a=[i for i in input().split()]
b=[float(i) for i in input().split()]
c=[]
for i in range(n):
    k=list(a[i])
    del k[-1]
    del k[0]
    p=''.join(k)
    w=[int(q) for q in p.split(',')]
    c.append(sum(w)/b[i])
d=sorted(c)
f=sorted(b)
if n%2==0:
    e=(d[n//2-1]+d[n//2])/2
    g=(f[n//2-1]+f[n//2])/2
else:
    e=d[n//2]
    g=f[n//2]
for i in range(n):
    if c[i]>e and b[i]<g:
        ct+=1
print(ct)
```

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

#43033712提交状态

状态: Accepted

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Sat Dec 9 16:52:53 2023

@author: 陈亚德2300011106
"""
ct=0
n=int(input())
a=[i for i in input().split()]
b=[float(i) for i in input().split()]
c=[]
for i in range(n):
    k=list(a[i])
    del k[-1]
    del k[0]
    p=''.join(k)
    w=[int(q) for q in p.split(',')]
    c.append(sum(w)/b[i])
d=sorted(c)
f=sorted(b)
if n%2==0:
    e=(d[n//2-1]+d[n//2])/2
    g=(f[n//2-1]+f[n//2])/2
else:
    e=d[n//2]
    g=f[n//2]
for i in range(n):
    if c[i]>e and b[i]<g:
        ct+=1
print(ct)
```

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27300: 模型整理

<http://cs101.openjudge.cn/practice/27300>

思路:

直接把值算出来, 再排序

简单的字符串处理, 但我卡了40分钟, 易错

代码

```
#
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 23:01:12 2024

@author: 陈亚德 2300011106
"""
def boza(n):
    if str(n)[-2:] == '.0':
        return int(n)
    else:
        return n
from collections import defaultdict
lt={'M':1, 'B':1000}
k=int(input())
dt=defaultdict(list)
for i in range(k):
    a,b=map(str,input().split('-'))
    dt[a].append(b)
for i in dt.keys():
    for j in range(len(dt[i])):
        z=dt[i][j][-1]
        dt[i][j]=float(dt[i][j][:-1])*lt[z]
    dt[i].sort()
    for j in range(len(dt[i])):
        if dt[i][j]>=1000:
            dt[i][j]=str(boza(dt[i][j]/1000))+ 'B'
        else:
            dt[i][j]=str(boza(dt[i][j]))+ 'M'
for i in sorted(dt.keys()):
    print(i+' ': '+', '.join(dt[i]))
```

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

状态: Accepted

源代码

```
# -*- coding: utf-8 -*-
"""
Created on Wed Mar  6 23:01:12 2024

@author: 陈亚偲 2300011106
"""
def boza(n):
    if str(n)[-2:] == '.0':
        return int(n)
    else:
        return n
from collections import defaultdict
lt={'M':1,'B':1000}
k=int(input())
dt=defaultdict(list)
for i in range(k):
    a,b=map(str,input().split('-'))
    dt[a].append(b)
for i in dt.keys():
    for j in range(len(dt[i])):
        z=dt[i][j][-1]
        dt[i][j]=float(dt[i][j][:-1])*lt[z]
    dt[i].sort()
    for j in range(len(dt[i])):
        if dt[i][j]>=1000:
            dt[i][j]=str(boza(dt[i][j]/1000))+ 'B'
        else:
            dt[i][j]=str(boza(dt[i][j]))+ 'M'
for i in sorted(dt.keys()):
    print(i+' : '+' , '.join(dt[i]))
```

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2. 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“2024spring每日选做”、CF、LeetCode、洛谷等网站题目。==

一个假期没碰python，很多都生疏了，一些lambda和{:.2f}.format()一类的语法，还需加强

dp基本忘干净了，第一题还能做出来感觉挺奇妙的，希望三月份把dp捡回来

这次虽然全能做出来，但时间超了将近一个小时，希望下次花少点时间debug