

Assignment #2: 编程练习

Updated 0953 GMT+8 Feb 24, 2024

2024 spring, Compiled by 物理学院 田济维

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) 课程网站是Canvas平台, <https://pku.instructure.com>, 学校通知3月1日导入选课名单后启用。**作业写好后，保留在自己手中，待3月1日提交。**

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

(python pycharm)

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. 题目

27653: Fraction类

<http://cs101.openjudge.cn/practice/27653/>

思路:

代码

```
1 # from math import gcd
2 class Fraction:
3     def __init__(self, numer, denom):
4         self.numer = numer
5         self.denom = denom
6
7     def add(self, frac2):
8         tempn = self.numer*frac2.denom+self.denom*frac2.numer
9         tempd = self.denom*frac2.denom
10        s = gcd(tempn, tempd)
11        n = tempn//s
12        d = tempd//s
13        frac3 = Fraction(n, d)
14        return frac3
15
16    def printf(self):
17        print(f"{self.numer}/{self.denom}")
18 n1, d1, n2, d2 = map(int, input().split())
19 f1 = Fraction(n1, d1)
20 f2 = Fraction(n2, d2)
21 f3 = f1.add(f2)
22 f3.printf()
23
24
```

代码运行截图 (至少包含有"Accepted")

#43997052提交状态

[查看](#) [提交](#) [统计](#) [提问](#)

状态: **Accepted**

源代码

```
from math import gcd
class Fraction:
    def __init__(self, numer, denom):
        self.numer = numer
        self.denom = denom

    def add(self, frac2):
        tempn = self.numer*frac2.denom+self.denom*frac2.numer
        tempd = self.denom*frac2.denom
        s = gcd(tempn, tempd)
        n = tempn//s
        d = tempd//s
        frac3 = Fraction(n, d)
        return frac3

    def printf(self):
        print(f"{self.numer}/{self.denom}")
n1, d1, n2, d2 = map(int, input().split())
f1 = Fraction(n1, d1)
f2 = Fraction(n2, d2)
f3 = f1.add(f2)
f3.printf()
```

基本信息

#: 43997052
题目: 27653
提交人: 23n2300011503
内存: 3552kB
时间: 22ms
语言: Python3
提交时间: 2024-02-27 16:29:06

04110: 圣诞老人的礼物-Santa Clau's Gifts

greedy/dp, <http://cs101.openjudge.cn/practice/04110>

思路:

代码

```
1  #
2  n,w = map(int,input().split())
3  goods = []
4  for i in range(n):
5      goods.append(list(map(int,input().split())))
6  goods=sorted(goods,key=lambda x:x[1]/x[0])
7  cnt = 0
8  index = 0
9
10 while w>0 and index<n:
11     if w>=goods[index][1]:
12         w-=goods[index][1]
13         cnt +=goods[index][0]
14     else:
15         cnt+=goods[index][0]*w/goods[index][1]
16         w=0
17     index+=1
18 print("%.1f"%cnt)
```

代码运行截图 (至少包含有"Accepted")

状态: Accepted

源代码

```
n,w = map(int,input().split())
goods = []
for i in range(n):
    goods.append(list(map(int,input().split())))
goods=sorted(goods,key=lambda x:x[1]/x[0])
cnt = 0
index = 0

while w>0 and index<n:
    if w>=goods[index][1]:
        w-=goods[index][1]
        cnt +=goods[index][0]
    else:
        cnt+=goods[index][0]*w/goods[index][1]
        w=0
    index+=1
print("%.1f"%cnt)
```

基本信息

#: 41761761
题目: 04110
提交人: 23n2300011503
内存: 3628kB
时间: 21ms
语言: Python3
提交时间: 2023-10-18 19:37:49

18182: 打怪兽

implementation/sortings/data structures, <http://cs101.openjudge.cn/practice/18182/>

思路:

代码

```
1  #
2  _ = int(input())
3  def main():
4      n, m, b = map(int, input().split())
5      t_x = {}
6      for j in range(n):
7          t, x = map(int, input().split())
8          if t in t_x:
9              t_x[t].append(x)
10         else:
11             t_x[t] = [x]
12     time = list(t_x.keys())
13     time.sort()
14     for t in time:
15         y = 0
16         if len(t_x[t]) <= m:
17             y = sum(t_x[t])
18         else:
19             t_x[t].sort()
20             t_x[t].reverse()
21             y = sum(t_x[t][:m])
22         b -= y
23         if b <= 0:
24             print(t)
25             return
26     print("alive")
27 for i in range(_):
28     main()
```

代码运行截图 (AC代码截图, 至少包含有"Accepted")

状态: Accepted

源代码

```
_= int(input())
def main():
    n, m, b = map(int, input().split())
    t_x = {}
    for j in range(n):
        t, x = map(int, input().split())
        if t in t_x:
            t_x[t].append(x)
        else:
            t_x[t] = [x]
    time = list(t_x.keys())
    time.sort()
    for t in time:
        y = 0
        if len(t_x[t]) <= m:
            y = sum(t_x[t])
        else:
            t_x[t].sort()
            t_x[t].reverse()
            y = sum(t_x[t][:m])
        b -= y
        if b <= 0:
            print(t)
            return
    print("alive")
for i in range(_):
    main()
```

基本信息

#: 37847898
题目: 18182
提交人: 23n2300011503
内存: 31880kB
时间: 174ms
语言: PyPy3
提交时间: 2022-12-02 22:46:11

230B. T-primes

binary search/implementation/math/number theory, 1300, <http://codeforces.com/problemset/problem/230/B>

思路:

代码

```
1 #
2 M = 1000000
3 Num = [True]*M
4 su = []
5 for i in range(M):
6     if Num[i]==True:
7         su.append(i+2)
8         index = 0
9         while index<len(su) and (i+2)*su[index]-2<M :
10             Num[(i+2)*su[index]-2]=False
11             if (i+2)%su[index]==0:
12                 break
13             index+=1
14
15 n = int(input())
16 s = input().split()
17 for i in range(n):
18     l=int(s[i])**0.5
19     if l!=int(l):
20         print("NO")
21         continue
22     if Num[int(l)-2]:
23         print("YES")
```

```

24     else:
25         print("NO")

```

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	
227533150	Practice: superlimit	230B - 28	Python 3	Accepted	1994 ms	22248 KB	2023-10-10 15:23:57	2023-10-10 15:23:57	★ Compare

1364A. XXXXX

brute force/data structures/number theory/two pointers, 1200, <https://codeforces.com/problems/et/problem/1364/A>

思路:

代码

```

1  #
2  n = int(input())
3  for k in range(n):
4      L,x = map(int,input().split())
5      shu = list(map(int,input().split()))
6      if sum(shu)%x !=0:
7          print(L)
8          continue
9      for i in range(L):
10         shu[i]=[1,0][shu[i]%x==0]
11
12
13     try:
14         x1 = shu.index(1)
15     except ValueError:
16         print(-1)
17         continue
18     else:
19         shu.reverse()
20         x2 = shu.index(1)
21         print(L-min(x1+1,x2+1))
22

```

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	
227353007	Practice: superlimit	1364A - 15	Python 3	Accepted	249 ms	18064 KB	2023-10-09 17:50:55	2023-10-09 17:50:55	★ Compare

18176: 2050年成绩计算

<http://cs101.openjudge.cn/practice/18176/>

思路：

代码

```

1  #
2  M = 10000
3  num = [True]*M
4
5  for i in range(102):
6      if num[i]:
7          k = 2
8          while (i+2)*k<(M+2):
9              num[(i+2)*k-2]=False
10             k+=1
11 m,n = map(int,input().split())
12
13
14 for i in range(m):
15     aa = list(map(int,input().split()))
16     cnt = 0
17     for x in aa:
18         c = x**0.5
19         if int(c) == c and c>=2 and num[int(c)-2]:
20             cnt+=x
21
22
23
24     if cnt==0:
25         print(0)
26     else:
27         a = cnt/len(aa)
28         print("%.2f"%a)

```

代码运行截图 (AC代码截图，至少包含有"Accepted")

状态: Accepted

源代码

```
M = 10000
num = [True]*M

for i in range(102):
    if num[i]:
        k = 2
        while (i+2)*k<(M+2):
            num[(i+2)*k-2]=False
            k+=1
m,n = map(int,input().split())

for i in range(m):
    aa = list(map(int,input().split()))
    cnt = 0
    for x in aa:
        c = x**0.5
        if int(c) == c and c>=2 and num[int(c)-2]:
            cnt+=x

    if cnt==0:
        print(0)
    else:
        a = cnt/len(aa)
        print("%.2f"%a)
```

基本信息

#: 42990466
题目: E18176
提交人: 23n2300011503
内存: 3732kB
时间: 71ms
语言: Python3
提交时间: 2023-12-07 15:50

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。

python 复习第二轮