Assignment #2: 编程练习

Updated 0953 GMT+8 Feb 24, 2024

2024 spring, Complied by ==同学的姓名、院系==

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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

==（请改为同学的操作系统、编程环境等）==

操作系统：Windows 10

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

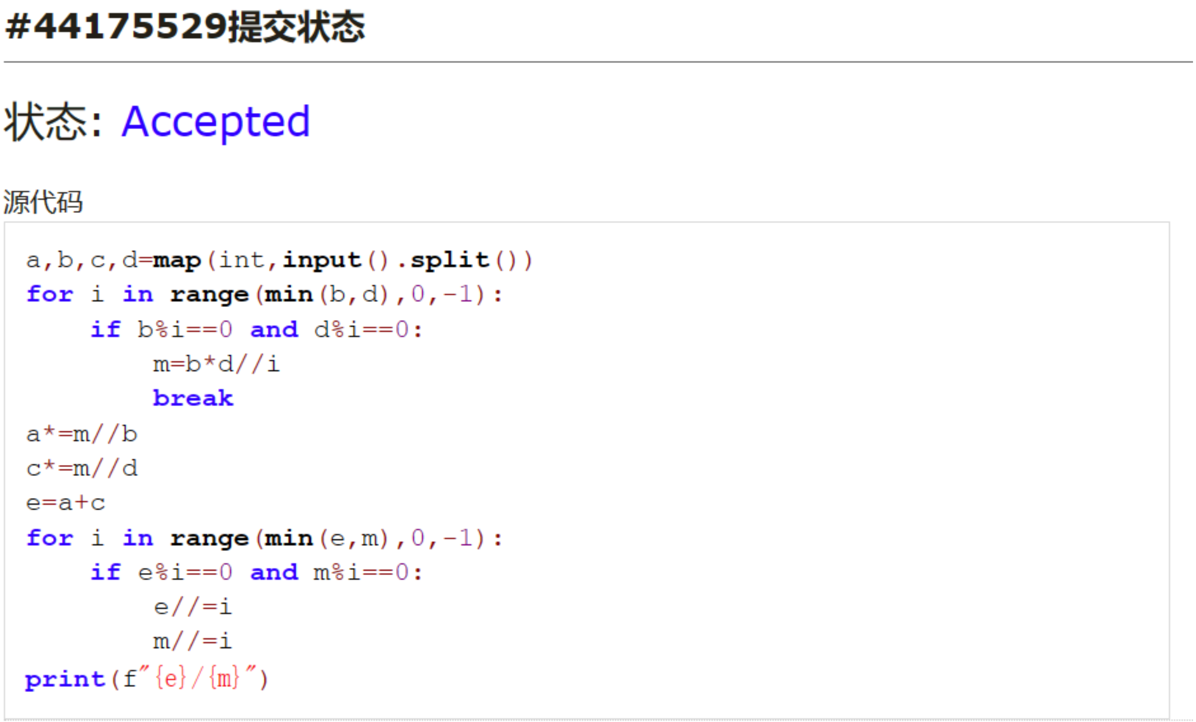
http://cs101.openjudge.cn/practice/27653/

思路：

代码

```python
#
a,b,c,d=map(int,input().split())
for i in range(min(b,d),0,-1):
    if b%i==0 and d%i==0:
        m=b*d//i
        break
a*=m//b
c*=m//d
e=a+c
for i in range(min(e,m),0,-1):
    if e%i==0 and m%i==0:
        e//=i
        m//=i
print(f"{e}/{m}")
```

代码运行截图 == （至少包含有"Accepted"） ==



#44175529提交状态

状态: Accepted

源代码

```python
a,b,c,d=map(int,input().split())
for i in range(min(b,d),0,-1):
    if b%i==0 and d%i==0:
        m=b*d//i
        break
a*=m//b
c*=m//d
e=a+c
for i in range(min(e,m),0,-1):
    if e%i==0 and m%i==0:
        e//=i
        m//=i
print(f"{e}/{m}")
```

04110: 圣诞老人的礼物-Santa Clau’s Gifts

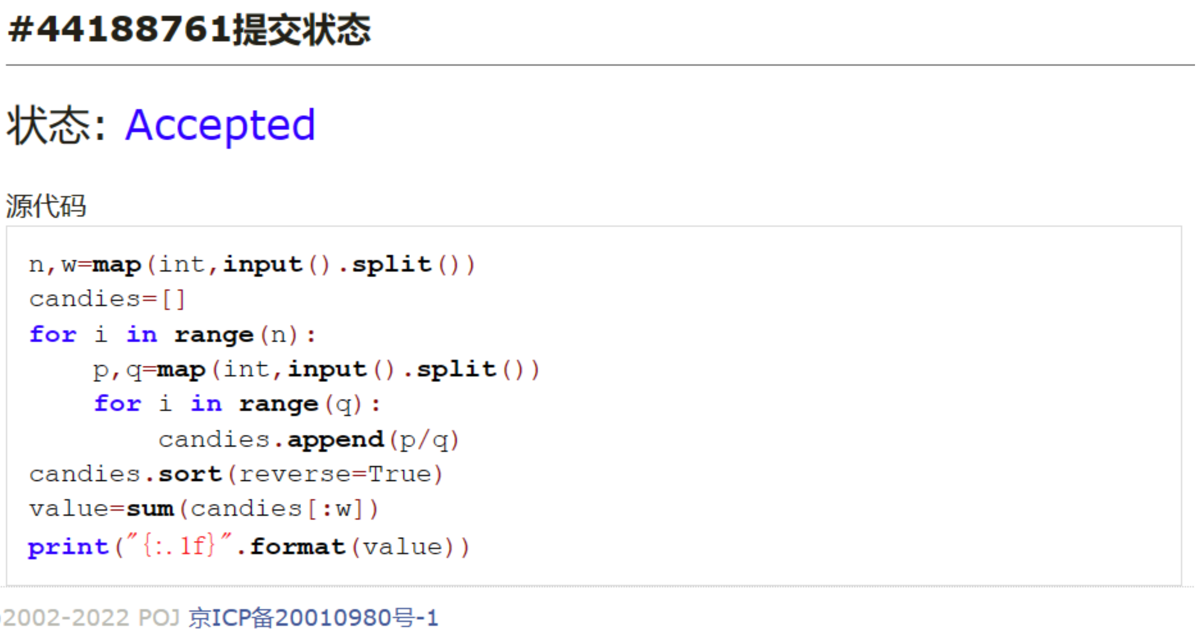
greedy/dp, http://cs101.openjudge.cn/practice/04110

思路：

代码

```
#
n,w=map(int,input().split())
candies=[]
for i in range(n):
    p,q=map(int,input().split())
    for i in range(q):
        candies.append(p/q)
candies.sort(reverse=True)
value=sum(candies[:w])
print("{:.1f}".format(value))
```

代码运行截图 ==（至少包含有"Accepted"）==



#44188761提交状态

状态: Accepted

源代码

```
n,w=map(int,input().split())
candies=[]
for i in range(n):
    p,q=map(int,input().split())
    for i in range(q):
        candies.append(p/q)
candies.sort(reverse=True)
value=sum(candies[:w])
print("{:.1f}".format(value))
```

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18182: 打怪兽

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

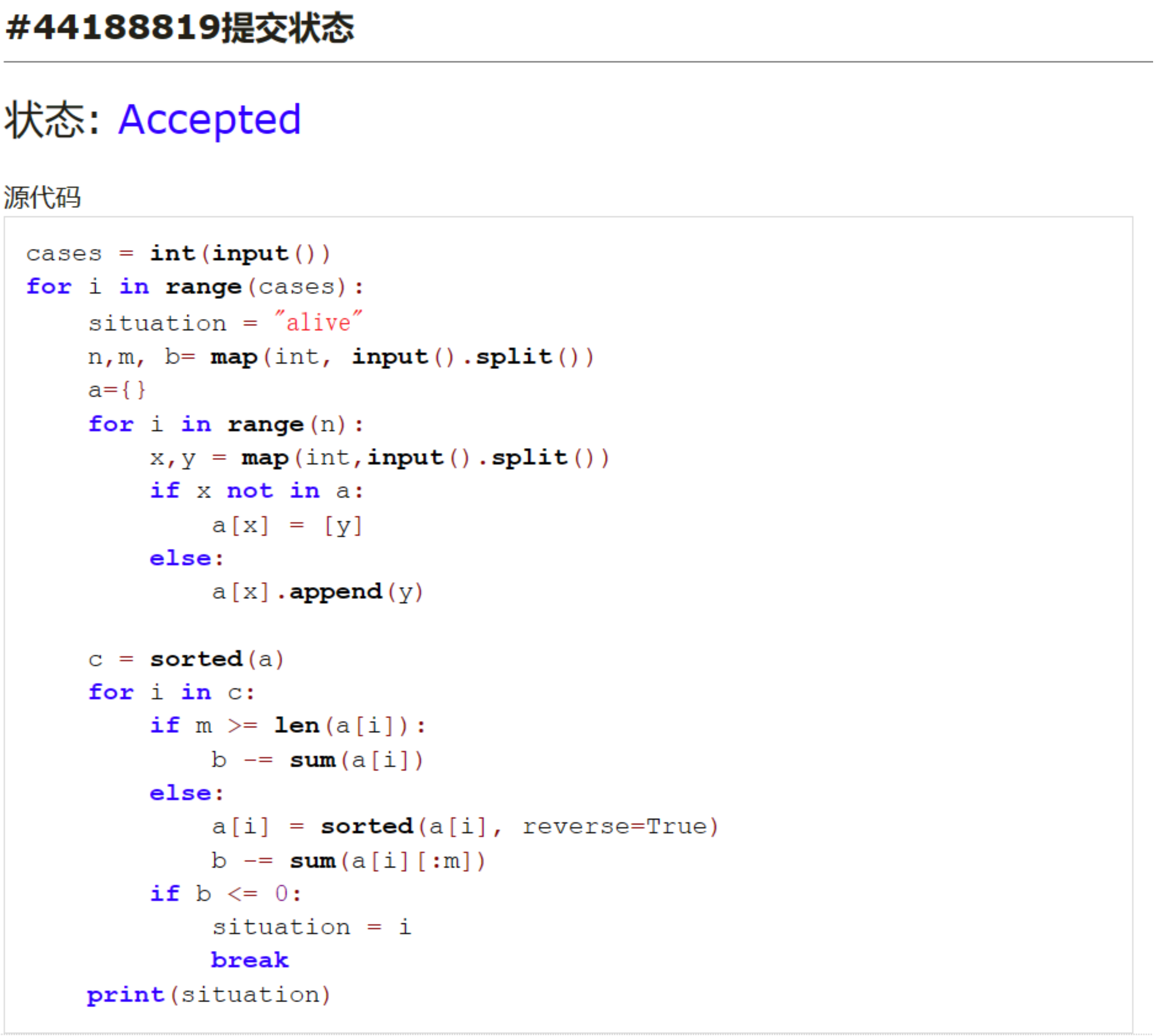
思路:

代码

```
#
cases = int(input())
for i in range(cases):
    situation = "alive"
    n,m, b= map(int, input().split())
    a={}
    for i in range(n):
        x,y = map(int,input().split())
        if x not in a:
            a[x] = [y]
        else:
            a[x].append(y)

    c = sorted(a)
    for i in c:
        if m >= len(a[i]):
            b -= sum(a[i])
        else:
            a[i] = sorted(a[i], reverse=True)
            b -= sum(a[i][:m])
        if b <= 0:
            situation = i
            break
    print(situation)
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



#44188819提交状态

状态: Accepted

源代码

```
cases = int(input())
for i in range(cases):
    situation = "alive"
    n,m, b= map(int, input().split())
    a={}
    for i in range(n):
        x,y = map(int,input().split())
        if x not in a:
            a[x] = [y]
        else:
            a[x].append(y)

    c = sorted(a)
    for i in c:
        if m >= len(a[i]):
            b -= sum(a[i])
        else:
            a[i] = sorted(a[i], reverse=True)
            b -= sum(a[i][:m])
        if b <= 0:
            situation = i
            break
    print(situation)
```

230B. T-primes

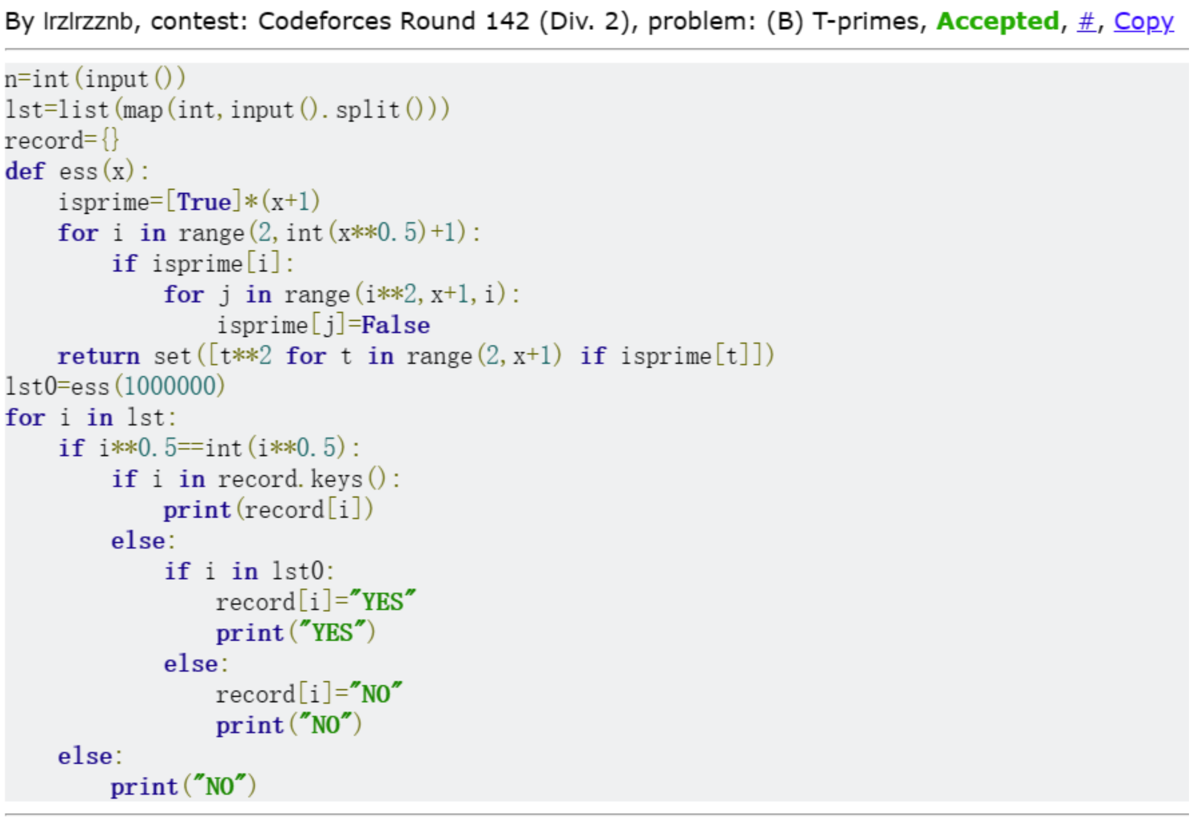
binary search/implementation/math/number theory, 1300, http://codeforces.com/problemset/problem/230/B

思路：

代码

```
#
n=int(input())
lst=list(map(int,input().split()))
record={}
def ess(x):
    isprime=[True]*(x+1)
    for i in range(2,int(x**0.5)+1):
        if isprime[i]:
            for j in range(i**2,x+1,i):
                isprime[j]=False
    return set([t**2 for t in range(2,x+1) if isprime[t]])
lst0=ess(1000000)
for i in lst:
    if i**0.5==int(i**0.5):
        if i in record.keys():
            print(record[i])
        else:
            if i in lst0:
                record[i]="YES"
                print("YES")
            else:
                record[i]="NO"
                print("NO")
    else:
        print("NO")
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



By lrzlrzznb, contest: Codeforces Round 142 (Div. 2), problem: (B) T-primes, Accepted, #, Copy

```
n=int(input())
lst=list(map(int,input().split()))
record={}
def ess(x):
    isprime=[True]*(x+1)
    for i in range(2,int(x**0.5)+1):
        if isprime[i]:
            for j in range(i**2,x+1,i):
                isprime[j]=False
    return set([t**2 for t in range(2,x+1) if isprime[t]])
lst0=ess(1000000)
for i in lst:
    if i**0.5==int(i**0.5):
        if i in record.keys():
            print(record[i])
        else:
            if i in lst0:
                record[i]="YES"
                print("YES")
            else:
                record[i]="NO"
                print("NO")
    else:
        print("NO")
```

1364A. XXXXX

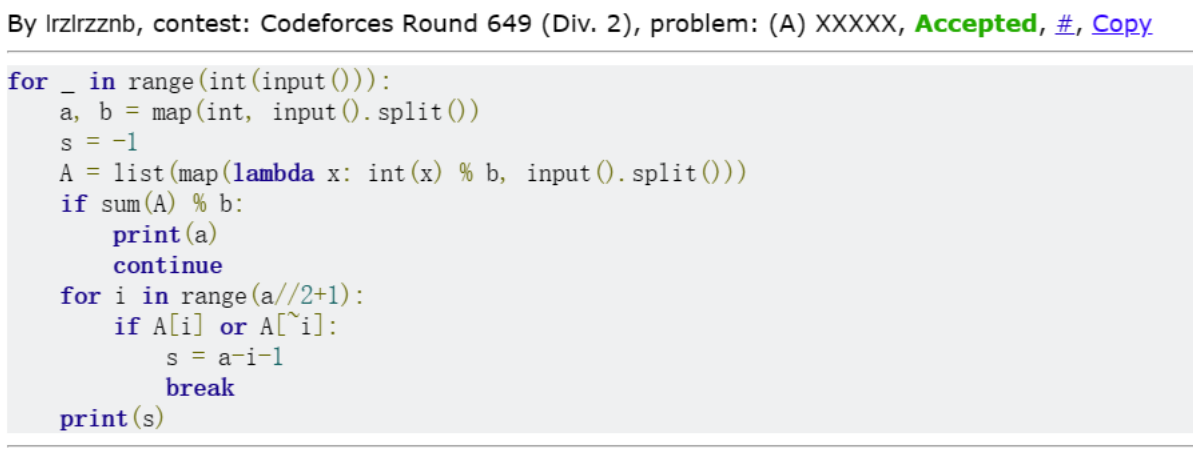
brute force/data structures/number theory/two pointers, 1200, https://codeforces.com/problemset/problem/1364/A

思路：

代码

```
# 
for _ in range(int(input())):
    a, b = map(int, input().split())
    s = -1
    A = list(map(lambda x: int(x) % b, input().split()))
    if sum(A) % b:
        print(a)
        continue
    for i in range(a//2+1):
        if A[i] or A[~i]:
            s = a-i-1
            break
    print(s)
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



By lrzlrzznb, contest: Codeforces Round 649 (Div. 2), problem: (A) XXXXX, Accepted, #, Copy

```
for _ in range(int(input())):
    a, b = map(int, input().split())
    s = -1
    A = list(map(lambda x: int(x) % b, input().split()))
    if sum(A) % b:
        print(a)
        continue
    for i in range(a//2+1):
        if A[i] or A[~i]:
            s = a-i-1
            break
    print(s)
```

18176: 2050年成绩计算

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

思路:

代码

```
#
m,n=map(int,input().split())
```

```
lst0=set([4, 9, 25, 49, 121, 169, 289, 361, 529, 841, 961, 1369, 1681, 1849,
2209, 2809, 3481, 3721, 4489, 5041, 5329, 6241, 6889, 7921, 9409, 10201, 10609,
11449, 11881, 12769, 16129, 17161, 18769, 19321, 22201, 22801, 24649, 26569,
27889, 29929, 32041, 32761, 36481, 37249, 38809, 39601, 44521, 49729, 51529,
52441, 54289, 57121, 58081, 63001, 66049, 69169, 72361, 73441, 76729, 78961,
80089, 85849, 94249, 96721, 97969, 100489, 109561, 113569, 120409, 121801,
124609, 128881, 134689, 139129, 143641, 146689, 151321, 157609, 160801, 167281,
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299209, 310249, 316969, 323761, 326041, 332929, 344569, 351649, 358801, 361201,
368449, 375769, 380689, 383161, 398161, 410881, 413449, 418609, 426409, 434281,
436921, 452929, 458329, 466489, 477481, 491401, 502681, 516961, 528529, 537289,
546121, 552049, 564001, 573049, 579121, 591361, 597529, 619369, 635209, 654481,
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1038361, 1042441, 1062961, 1067089, 1079521, 1100401, 1104601, 1125721, 1129969,
1142761, 1181569, 1190281, 1194649, 1203409, 1216609, 1229881, 1247689, 1261129,
1274641, 1324801, 1329409, 1352569, 1371241, 1394761, 1408969, 1423249, 1442401,
1471369, 1481089, 1495729, 1510441, 1515361, 1530169, 1560001, 1585081, 1630729,
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1745041, 1760929, 1852321, 1868689, 1885129, 1907161, 1957201, 1985281, 2024929,
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2193361, 2199289, 2211169, 2217121, 2229049, 2247001, 2283121, 2319529, 2343961,
2380849, 2399401, 2411809, 2430481, 2455489, 2468041, 2493241, 2505889, 2550409,
2563201, 2582449, 2588881, 2601769, 2621161, 2627641, 2647129, 2679769, 2745649,
2765569, 2778889, 2785561, 2866249, 2879809, 2886601, 2920681, 2961841, 2968729,
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3243601, 3279721, 3323329, 3352561, 3411409, 3463321, 3485689, 3500641, 3508129,
3523129, 3530641, 3568321, 3613801, 3636649, 3659569, 3728761, 3736489, 3798601,
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12581209, 12652249, 12666481, 12752041, 12823561, 12837889, 12909649, 13010449,
13053769, 13082689, 13126129, 13184161, 13227769, 13271449, 13388281, 13476241,
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56595529, 56685841, 56806369, 56866681, 56957209, 56987401, 57138481, 57168721,
57350329, 57410929, 57501889, 57592921, 57623281, 57805609, 57866449, 58079641,
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59274601, 59336209, 59552089, 59644729, 59706529, 59923081, 60109009, 60171049,
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62837329, 62932489, 62995969, 63186601, 63218401, 63409369, 63888049, 64144081,
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65431921, 65496649, 65626201, 65788321, 65885689, 65983129, 66373609, 66601921,
66699889, 66765241, 66896041, 67092481, 67387681, 67551961, 67584841, 67749361,
67782289, 67848169, 67947049, 68277169, 68376361, 68442529, 68674369, 68740681,
68773849, 68840209, 69072721, 69172489, 69372241, 69772609, 69939769, 70040161,
70174129, 70341769, 70375321, 70879561, 70946929, 71048041, 71081761, 71284249,
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86843761, 86918329, 87179569, 87254281, 87291649, 87403801, 87815641, 87928129,
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94848121, 94926049, 95043001, 95394289, 95433361, 95667961, 95785369, 95863681,
96098809, 96255721, 96373489, 96609241, 96687889, 96805921, 97042201, 97160449,
97199881, 97436641, 97673689, 97752769, 98029801, 98148649, 98465929, 98585041,
98624761, 98823481, 98982601, 99341089, 99460729])
for i in range(m):
    score=0
    nums=0
    for j in list(map(int,input().split())):
        nums+=1
        if j in lst0:
            score+=j
    if score==0:
        print(0)
    else:
        score/=nums
        print("%.2f"%score)
```
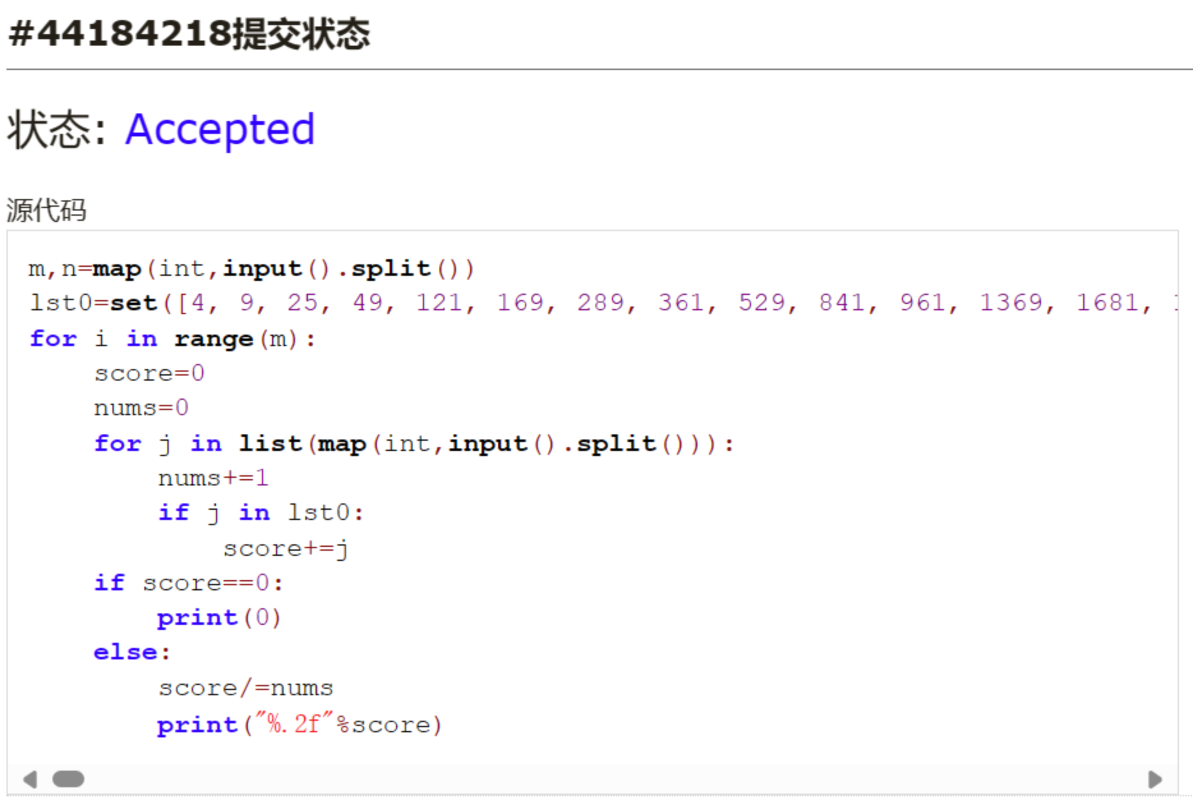

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==



#44184218提交状态

状态: Accepted

源代码

```
m,n=map(int,input().split())
lst0=set([4, 9, 25, 49, 121, 169, 289, 361, 529, 841, 961, 1369, 1681, 
for i in range(m):
    score=0
    nums=0
    for j in list(map(int,input().split())):
        nums+=1
        if j in lst0:
            score+=j
    if score==0:
        print(0)
    else:
        score/=nums
        print("%.2f"%score)
```

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。==

本次作业难度较上次有所提升，主要是时间限制的问题，我TLE的次数比较多，今后需要注意如何减少时间消耗。