Assignment #5: Greedy穷举 Implementation

Updated 1939 GMT+8 Oct 21, 2024

2024 fall, Complied by 佟永鑫 元培学院

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），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。

1. 题目

04148: 生理周期

brute force, http://cs101.openjudge.cn/practice/04148

思路：

找到距d最近的p峰值，依次增加23判断是否是e，i峰值

代码：

```
def slzq(p, e, i, d):
    b = abs(d - p) % 23
    day = d + ( 23 - b if p <= d else b)
    while True:
        if abs(day - e) % 28 == 0:
            if abs(day - i) % 33 == 0:
                break
        day += 23
    return day - d

case_number = 1
while True:
    line = input().strip()
    if line == "-1 -1 -1 -1":
        break
    p, e, i, d = map(int, line.split())
    result = slzq(p, e, i, d)
    print(f"Case {case_number}: the next triple peak occurs in {result} days.")
    case_number += 1
```

代码运行截图 （至少包含有"Accepted"）

#46809969提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
def slzq(p, e, i, d):
    b = abs(d - p) % 23
    day = d + ( 23 - b if p <= d else b)
    while True:
        if abs(day - e) % 28 == 0:
            if abs(day - i) % 33 == 0:
                break
        day += 23
    return day - d

case_number = 1
while True:
    line = input().strip()
    if line == "-1 -1 -1 -1":
        break
    p, e, i, d = map(int, line.split())
    result = slzq(p, e, i, d)
    print(f"Case {case_number}: the next triple peak occurs in {result} days.")
    case_number += 1
```

基本信息

#: 46809969
题目: 04148
提交人: 佟永鑫
内存: 3620kB
时间: 27ms
语言: Python3
提交时间: 2024-10-29 13:42:37

English 帮助 关于

18211: 军备竞赛

greedy, two pointers, http://cs101.openjudge.cn/practice/18211

思路:

优先做最便宜的，卖最贵的

代码:

```
def jbjs(p, costs):
    costs.sort()
    count = 0
    sell = 0
    for cost in costs:
        if cost <= p:
            p -= cost
            count += 1
        elif cost > p and count > sell:
            sell_cost = costs[-1]
            p += sell_cost
            del costs[-1]
            sell += 1
            if cost <= p:
                p -= cost
                count += 1
    return count - sell

p = int(input().strip())
costs = list(map(int, input().strip().split()))
result = jbjs(p, costs)
print(result)
```

代码运行截图 ==（至少包含有"Accepted"）==

#46811388提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
def jbjs(p, costs):
    costs.sort()
    count = 0
    sell = 0
    for cost in costs:
        if cost <= p:
            p -= cost
            count += 1
        elif cost > p and count > sell:
            sell_cost = costs[-1]
            p += sell_cost
            del costs[-1]
            sell += 1
            if cost <= p:
                p -= cost
                count += 1
    return count - sell

p = int(input().strip())
costs = list(map(int, input().strip().split()))
result = jbjs(p, costs)
print(result)
```

基本信息

#: 46811388
题目: 18211
提交人: 佟永鑫
内存: 3644kB
时间: 25ms
语言: Python3
提交时间: 2024-10-29 14:43:55

English 帮助 关于

21554: 排队做实验

greedy, http://cs101.openjudge.cn/practice/21554

思路:

最快的人最先做实验

代码:

```
def pdsy(n, times):
    indexs = [(times[i], i + 1) for i in range(n)]
    indexs.sort(key=lambda x: x[0])
    total_waiting_time = 0
    current_time = 0
    waiting_times = []

    for time, index in indexs:
        waiting_times.append(current_time)
        total_waiting_time += current_time
        current_time += time

    average_waiting_time = total_waiting_time / n

    student_order = [index for _, index in indexs]
    print(" ".join(map(str, student_order)))
    print(f"{average_waiting_time:.2f}")

n = int(input().strip())
times = list(map(int, input().strip().split()))

pdsy(n, times)
```

代码运行截图 （至少包含有"Accepted"）

#46811585提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
def pdsy(n, times):
    indexs = [(times[i], i + 1) for i in range(n)]
    indexs.sort(key=lambda x: x[0])
    total_waiting_time = 0
    current_time = 0
    waiting_times = []

    for time, index in indexs:
        waiting_times.append(current_time)
        total_waiting_time += current_time
        current_time += time

    average_waiting_time = total_waiting_time / n

    student_order = [index for _, index in indexs]
    print(" ".join(map(str, student_order)))
    print(f"{average_waiting_time:.2f}")

n = int(input().strip())
times = list(map(int, input().strip().split()))

pdsy(n, times)
```

基本信息

#: 46811585
题目: 21554
提交人: 佟永鑫
内存: 3652kB
时间: 23ms
语言: Python3
提交时间: 2024-10-29 14:50:19

English 帮助 关于

01008: Maya Calendar

implementation, http://cs101.openjudge.cn/practice/01008/

思路:

代码:

```
def haab_to_tzolkin(haab_date):
    haab_months = [
        "pop", "no", "zip", "zotz", "tzec", "xul",
        "yoxkin", "mol", "chen", "yax", "zac", "ceh",
        "mac", "kankin", "muan", "pax", "koyab", "cumhu",
        "uayet"
    ]

    tzolkin_day_names = [
        "imix", "ik", "akbal", "kan", "chicchan",
        "cimi", "manik", "lamat", "muluk", "ok",
        "chuen", "eb", "ben", "ix", "mem",
        "cib", "caban", "eznab", "canac", "ahau"
    ]

    day_number, month_name, year = haab_date.split()
    day_number = int(day_number[:-1])
    year = int(year)

    month_index = haab_months.index(month_name)
    total_days = year * 365 + month_index * 20 + day_number
```

```
    tzolkin_year = total_days // 260
    tzolkin_day_number = (total_days % 260) % 13 + 1
    tzolkin_day_name = tzolkin_day_names[(total_days % 260) % 20]

    return f"{tzolkin_day_number} {tzolkin_day_name} {tzolkin_year}"

n = int(input())
haab_dates = []
for _ in range(n):
    haab_date = input().strip()
    haab_dates.append(haab_date)
output = []
output.append(str(n))
for haab_date in haab_dates:
    tzolkin_date = haab_to_tzolkin(haab_date)
    output.append(tzolkin_date)

print("\n".join(output))
```

代码运行截图 （至少包含有"Accepted"）

#46812465提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
def haab_to_tzolkin(haab_date):
    haab_months = [
        "pop", "no", "zip", "zotz", "tzec", "xul",
        "yoxkin", "mol", "chen", "yax", "zac", "ceh",
        "mac", "kankin", "muan", "pax", "koyab", "cumhu",
        "uayet"
    ]

    tzolkin_day_names = [
        "imix", "ik", "akbal", "kan", "chicchan",
        "cimi", "manik", "lamat", "muluk", "ok",
        "chuen", "eb", "ben", "ix", "mem",
        "cib", "caban", "eznab", "canac", "ahau"
    ]

    day_number, month_name, year = haab_date.split()
    day_number = int(day_number[:-1])
    year = int(year)

    month_index = haab_months.index(month_name)
    total_days = year * 365 + month_index * 20 + day_number

    tzolkin_year = total_days // 260
    tzolkin_day_number = (total_days % 260) % 13 + 1
    tzolkin_day_name = tzolkin_day_names[(total_days % 260) % 20]

    return f"{tzolkin_day_number} {tzolkin_day_name} {tzolkin_year}"

n = int(input())
haab_dates = []
for _ in range(n):
    haab_date = input().strip()
    haab_dates.append(haab_date)
output = []
output.append(str(n))
for haab_date in haab_dates:
    tzolkin_date = haab_to_tzolkin(haab_date)
    output.append(tzolkin_date)

print("\n".join(output))
```

基本信息

#:	46812465
题目:	01008
提交人:	佟永鑫
内存:	3600kB
时间:	29ms
语言:	Python3
提交时间:	2024-10-29 15:23:06

545C. Woodcutters

dp, greedy, 1500, https://codeforces.com/problemset/problem/545/C

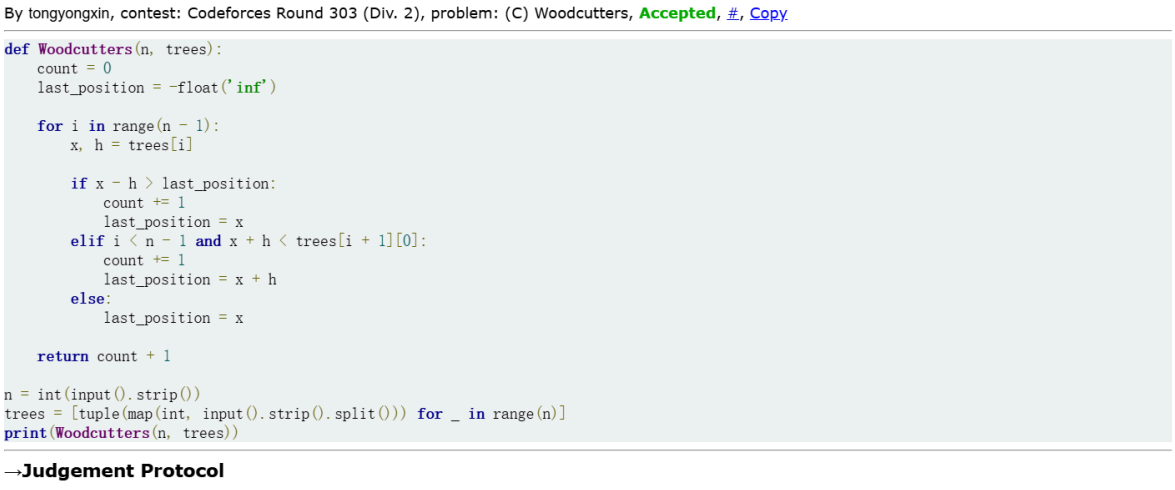
思路：

从最左边开始依次判断

代码：

```
def Woodcutters(n, trees):
count = 0
last_position = -float('inf')
for i in range(n - 1):
x, h = trees[i]
if x - h > last_position:
count += 1
last_position = x
elif i < n - 1 and x + h < trees[i + 1][0]:
count += 1
last_position = x + h
else:
last_position = x
return count + 1
n = int(input().strip())
trees = [tuple(map(int, input().strip().split())) for _ in range(n)]
print(Woodcutters(n, trees))
```

代码运行截图 （至少包含有"Accepted"）



By tongyongxin, contest: Codeforces Round 303 (Div. 2), problem: (C) Woodcutters, **Accepted**, #, Copy

```
def Woodcutters(n, trees):
    count = 0
    last_position = -float('inf')

    for i in range(n - 1):
        x, h = trees[i]

        if x - h > last_position:
            count += 1
            last_position = x
        elif i < n - 1 and x + h < trees[i + 1][0]:
            count += 1
            last_position = x + h
        else:
            last_position = x

    return count + 1

n = int(input().strip())
trees = [tuple(map(int, input().strip().split())) for _ in range(n)]
print(Woodcutters(n, trees))
```

→**Judgement Protocol**

01328: Radar Installation

greedy, http://cs101.openjudge.cn/practice/01328/

思路：

和前题类似，一维变成二维

代码：

```python
import math
def Radar_Installation(n, d, islands):
    distances = []
    for x, y in islands:
        if y > d:
            return -1
        left = x - math.sqrt(d**2 - y**2)
        right = x + math.sqrt(d**2 - y**2)
        distances.append((left, right))
    distances.sort(key=lambda x: x[1])
    count = 0
    current_end = -float('inf')
    for distance in distances:
        left, right = distance
        if current_end < left:
            current_end = right
            count += 1
    return count
case_number = 1
while True:
    line = input().strip()
    if line == "0 0":
        break
    n, d = map(int, line.split())
    islands = []
    for _ in range(n):
        x, y = map(int, input().strip().split())
        islands.append((x, y))
    input()
    result = Radar_Installation(n, d, islands)
    print(f"Case {case_number}: {result}")
    case_number += 1
```

代码运行截图 （至少包含有"Accepted"）

状态：Accepted

源代码

```python
import math
def Radar_Installation(n, d, islands):
    distances = []
    for x, y in islands:
        if y > d:
            return -1
        left = x - math.sqrt(d**2 - y**2)
        right = x + math.sqrt(d**2 - y**2)
        distances.append((left, right))
    distances.sort(key=lambda x: x[1])
    count = 0
    current_end = -float('inf')
    for distance in distances:
        left, right = distance
        if current_end < left:
            current_end = right
            count += 1
    return count
case_number = 1
while True:
    line = input().strip()
    if line == "0 0":
        break
    n, d = map(int, line.split())
    islands = []
    for _ in range(n):
        x, y = map(int, input().strip().split())
        islands.append((x, y))
    input()
    result = Radar_Installation(n, d, islands)
    print(f"Case {case_number}: {result}")
    case_number += 1
```

基本信息

#:	46813486
题目:	01328
提交人:	佟永鑫
内存:	3792kB
时间:	54ms
语言:	Python3
提交时间:	2024-10-29 16:10:16

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“计概2024fall每日选做”、CF、LeetCode、洛谷等网站题目。

本次作业做起来很顺手，思路都很直接