
CS29003 ALGORITHMS LABORATORY

ASSIGNMENT 2

Date: 26th Aug, 2021

Important Instructions

1. Files to be submitted on moodle: ROLLNO_A02_P1.c/.cpp, ROLLNO_A02_P2.c/.cpp
 2. You are to stick to the input output formats strictly as per the instructions. Check using the testcases in Hackerrank.
 3. Moodle submission through .zip files are not allowed.
 4. Write your name, Hackerrank ID and roll number at the beginning of your program.
 5. Do not use any global variable unless you are explicitly instructed so.
 6. Use proper indentation in your code. Write rationale in comments before any big chunk of code (expecting 10 comments in proper places for each c/cpp file)
 7. There will be part marking. Part marking will depend a lot on clarity of code: *indentation and comments*
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Complexity

Question 1 (COMPULSORY): (100 marks)

Prince of Persia is on a quest in the pink city of India to find his beloved Princess Panchali. She and her twin brother have been abducted by a cruel witch who has transformed the beautiful princesses into Lily flowers and placed them in a huge pond with many other flowers. The Prince of Persia has come to rescue them and fought vigorously with the witch. The witch is dead now and the ancient scroll of witchcraft that the prince found in the witch's hat says that any person transformed into a flower can be saved only by the person most beloved to her just by his/her touch. But the person can touch only one flower(which has to be the princess) to save all persons in the pond of the witch which has n persons turned into flowers ($n > 1000000000000000$). If he touches any other flower first, all flowers disappear for eternity. The ancient scroll says further that the flower will have p petals, l leaves, r radius and h height where $1 \leq p, l, r, h \leq n$ and any two flowers will not have all the properties same.

Also, males and females are transformed into yellow and white Lilies respectively.

The prince is hopeless and very upset. Meanwhile, the monkey of princess Panchali informs him that both the princess and her brother were transformed into Lilies with the exact same attributes(except the color of course). He also claims that some of the Lilies have already died (so number of alive lilies min) making it even more difficult for the prince. The prince needs your help to find the princess. The friends of Princess Panchali's monkeys are already here from the jungle and have started counting the petals. But the prince does not know how to know for sure if he will be touching Princess Panchali only. He is clueless and calls you for help promising 100000 bhoris of Persian Gold. Can you help him to find his beloved (hoping that she did not die already)? 😊



(a) Princess Panchali with the Prince: Last Meet



(b) No Daal-Bati-Churma or Rabri-Jalebi for the princess!
Life now mostly boils down to photosynthesis.

Figure 1: Then & Now

Write a C/C++ function that takes necessary inputs from the monkeys regarding the number of petals and colors for all the flowers. Given they are monkeys and have no sense of order or sorting, print the properties (color, number of petals, number of leaves, radius, height) for the flower that is actually Princess.

Input:

The first line of the input contains the number of persons turned into flowers who are still alive = m

The next m lines will contain the attributes of each alive member. Attributes are separated by commas and attributes are in this order → color, number of petals, number of leaves, radius, height = c,p,l,r,h where p,l,r,h are integers and c is the string color either “yellow” or “white”.

Output: The first line of the output should contain the attributes of the flower who is princess actually. in the same format as input (comma separated attributes in order : c,p,l,r,h)

If it is impossible to find the princess exactly but you can pin down a set of x flowers who may be the princess print all of them in dictionary-sorted order in x lines.

If you suspect that the princess might have died already, print(“RIP”)

Example Inputs for Problem 1:

Example Input1:

```
5
yellow,1,2,1,2
yellow,5,6,8,2
white,5,5,9,2
white,1,2,1,2
white,1,2,3,2
```

Example Output1:

```
white,1,2,1,2
```

Rationale: Only white flower whose attributes match perfectly with another yellow flower.

Example Input2:

```
6
yellow,1,2,1,6
yellow,5,6,8,6
white,5,5,9,6
white,1,2,1,6
white,1,2,3,6
yellow,5,5,9,6
```

Example Output2:

```
white,1,2,1,6
white,5,5,9,6
```

Rationale: There are more than one white flower whose attributes match perfectly with another yellow flower. So, printed both in **dictionary sorted order**.

Example Input3:

```
4
yellow,5,6,8,6
white,5,5,9,6
white,1,2,1,6
white,1,2,3,6
```

Example Output3:

```
RIP
```

Rationale: There is no white flower whose attributes match perfectly with another yellow flower. So, printed RIP as what is dead may never die again.

Constraints: You must use struct to denote the flower and save each flower object like this.

```
typedef struct {
    char * color ;
    int npetals;
    int leaves;
    int radius;
    int height;} Flower;
```

HINT : Think what you would have done if the input were dictionary sorted (starting from minimum white,1,1,1,1 towards maximum yellow,n,n,n,n). Think how will you use the information that the bounds of all these numbers are already given (i.e. all numbers are integers and varies between 1 and n, what sorting mechanism may use that). **HINT:** Lowest complexity is O(n). You will get enough marks for any solution though.

Question 2 (BONUS): (30 marks)

Tragedy happened and the princess was already dead. But the prince met a red priestess from Volantis named Melisandre who promised to resurrect the princess from death. The red priestess also said that the Lord of Light has spoken to her in her dream and has said that people of royal blood always had prime numbered numeric attributes (e.g. yellow,3,7,5,3) something that the ancient scroll did not mention. Melissandre used her power now to resurrect all flowers for 10 mins. You have even less time to give the output now but you must succeed or the princess is lost for eternity, never to be born or resurrected again, in a world beyond even death itself. The prince has called you and promised 10 times the previous reward.

Good thing is that the monkeys are good at prime numbers and will give you all flowers that has prime numbered attributes.

Given the same pattern of inputs (the first line contains number of flowers that monkeys give to you for evaluation), print the output in the same pattern.

HINT: Have you heard about the chief librarian at the Library of Alexandria who happened to be a polymath living around 276 BC-195BC, born in the ancient Greek civilization (Libya to be exact) where all the basic foundations of modern science, politics and philosophy started? He had a thing for prime numbers!

Example Input for the Bonus Problem:

```
11
yellow,3,2,3,11
yellow,5,7,97,11
white,5,5,97,11
white,13,29,31,13
white,3,2,3,11
yellow,5,5,19,13
yellow,19,19,19,17
white,19,19,10,17
yellow,19,19,10,17
white,10,19,19,19
yellow,10,19,19,11
```

Example Output:

```
white,3,2,3,11
```

Rationale: Only white flower with all prime numeric attributes(3,2,3,11) that also shares same numeric attributes with another yellow flower.

Make sure to read from a file named “*input.txt*”. Create a sample input file with the content of input as shown in examples above to test your code. At the time of evaluation, the input data might be different from the one given here.

You need not submit “*output.txt*”, but your code should write the output in the given format in a file named “*output.txt*”