

II Year I Semester

L T P C

Code: 17CS311

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PYTHON PROGRAMMING LAB

Exercise 1 – Basics

- Running instructions in Interactive interpreter and a Python Script
- Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

- Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

- Write a Program for checking whether the given number is a even number or not.
- Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10
- Write a program using a for loop that loops over a sequence. What is sequence ?
- Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

- Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
- By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

- Write a program to count the numbers of characters in the string and store them in a dictionary data structure
- Write a program to use split and join methods in the string and trace a birthday with a Dictionary data structure.

Exercise - 6 DS - Continued

- Write a program combine lists that combines these lists into a dictionary.
- Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

- Write a program to print each line of a file in reverse order.
- Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

- Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) \leq (sum of their radii) then (they are colliding)

- b. Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

- a. Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
- b. Write a function `dups` to find all duplicates in the list.
- c. Write a function `unique` to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

- a. Write a function `cumulative_product` to compute cumulative product of a list of numbers.
- b. Write a function `reverse` to reverse a list. Without using the reverse function.
- c. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

- a. Write a program that defines a matrix and prints
- b. Write a program to perform addition of two square matrices
- c. Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

- a. Install packages requests, flask and explore them. using (pip)
- b. Write a script that imports requests and fetch content from the page. Eg. (Wiki)
- c. Write a simple script that serves a simple HTTPResponse and a simple HTML Page

Exercise - 13 OOP

- a. Class variables and instance variable and illustration of the self variable
 - i) Robot
 - ii) ATM Machine

Exercise - 14 - Testing

- a. Write a test-case to check the function even numbers which return True on passing a list of all even numbers
- b. Write a test-case to check the function reverse string which returns the reversed string

Exercise – 15 - Advanced

- a. Build any one classical data structure.
- b. Write a program to solve knapsack problem.

List of Mini Projects

1. Here are some basic facts about tennis scoring: A tennis match is made up of sets. A set is made up of games.

To win a set, a player has to win 6 games with a difference of 2 games. At 6-6, there is often a special tie-breaker. In some cases, players go on playing till one of them wins the set with a difference of two games.

Tennis matches can be either 3 sets or 5 sets. The player who wins a majority of sets wins the match (i.e., 2 out of 3 sets or 3 out of 5 sets) The score of a match lists out the games in each set, with the overall winner's score reported first for each set. Thus, if the score is 6-3, 5-7, 7-6 it means that the first player won the first set by 6 games to 3, lost the second one 5 games to 7 and won the third one 7 games to 6 (and hence won the overall match as well by 2 sets to 1).

You will read input from the keyboard (standard input) containing the results of several tennis matches. Each match's score is recorded on a separate line with the following format:

Winner: Loser: Set-1-score,....,Set-k-score, where $2 \leq k \leq 5$

For example, an input line of the form

Halep: Wozniacki:3-6,6-3,6-3

indicates that Halep beat Wozniacki 3-6, 6-3, 6-3 in a best of 3 set match.

The input is terminated by a blank line.

You have to write a Python program that reads information about all the matches and compile the following statistics for each player:

1. Number of best-of-5 set matches won
2. Number of best-of-3 set matches won
3. Number of sets won
4. Number of games won
5. Number of sets lost
6. Number of games lost

You should print out to the screen (standard output) a summary in decreasing order of ranking, where the ranking is according to the criteria 1-6 in that order (compare item 1, if equal compare item 2, if equal compare item 3 etc, noting that for items 5 and 6 the comparison is reversed).

For instance, given the following data

Federer:Nadal:2-6,6-7,7-6,6-3,6-1

Nadal:Federer:6-3,4-6,6-4,6-3

Federer:Nadal:6-0,7-6,6-7,6-3

Nadal:Federer:6-4,6-4

Federer:Nadal:2-6,6-2,6-0

Nadal:Federer:6-3,4-6,6-3,6-4

Federer:Nadal:7-6,4-6,7-6,2-6,6-2

Nadal:Federer:7-5,7-5

Halep:Wozniacki:3-6,6-3,6-3

your program should print out the following

Federer 3 1 13 142 16 143

Nadal 2 2 16 143 13 142

Halep 0 1 2 15 1 12

Wozniacki 0 0 1 12 2 15

You can assume that there are no spaces around the punctuation marks ":", "-", and ".". Each player's name will be spelled consistently and no two players have the same name.

2. Write a Python function histogram(l) that takes as input a list of integers with repetitions and returns a

list of pairs as follows:

- For each number n that appears in l, there should be exactly one pair (n,r) in the list returned by the function, where r is the number of repetitions of n in l.
- The final list should be sorted in ascending order by r, the number of repetitions. For numbers that occur with the same number of repetitions, arrange the pairs in ascending order of the value of the number.

For instance:

```
>>> histogram([13,12,11,13,14,13,7,7,13,14,12])
```

```
[(11, 1), (7, 2), (12, 2), (14, 2), (13, 4)]
```

```
>>> histogram([7,12,11,13,7,11,13,14,12])
```

```
[(14, 1), (7, 2), (11, 2), (12, 2), (13, 2)]
>>> histogram([13,7,12,7,11,13,14,13,7,11,13,14,12,14,14,7])
[(11, 2), (12, 2), (7, 4), (13, 4), (14, 4)]
```

3. The academic office at the Hogwarts School of Witchcraft and Wizardry has compiled data about students' grades. The data is provided as text from standard input in three parts: information about courses, information about students and information about grades. Each part has a specific line format, described below..

1. Information about courses
Line format: Course Code~CourseName~Semester~Year~Instructor
2. Information about students
Line format: Roll Number~Full Name
3. Information about grades
Line format: Course Code~Semester~Year~RollNumber~Grade

The possible grades are A, AB, B, BC, C, CD, D with corresponding grade points 10, 9, 8, 7, 6, 5 and 4. The grade point average of a student is the sum of his/her grade points divided by the number of courses. For instance, if a student has taken two courses with grades A and C, the grade point average is $8 = (10+6) \div 2$. If a student has not completed any courses, the grade point average is defined to be 0.

You may assume that the data is internally consistent. For every grade, there is a corresponding course code and roll number in the input data.

Each section of the input starts with a line containing a single keyword. The first section begins with a line containing Courses. The second section begins with a line containing Students. The third section begins with a line containing Grades. The end of the input is marked by a line containing EndOfInput.

Write a Python program to read the data as described above and print out a line listing the grade point average for each student in the following format:

Roll Number~FullName~Grade Point Average

Your output should be sorted by Roll Number. The grade point average should be rounded off to 2 digits after the decimal point. Use the built-in function round().

Here is a sample input and its corresponding output.

Sample Input

Courses

POT~Potions~1~2011-2012~Severus Snape

DADA~Defence Against the Dark ARTS~1~2011-2012~Gilderoy Lockhart

Students

RAV4309~Angelina Johnson

HUF7201~Gwenog Jones

GRF9110~Parvati Patil

RAV4308~Olive Hornby

Grades

POT~1~2011-2012~RAV4308~C

POT~1~2011-2012~RAV4309~B

POT~1~2011-2012~GRF9110~A

EndOfInputCHAR~1~2011-2012~SLY2306~C

CHAR~1~2011-2012~SLY2307~B
CHAR~1~2011-2012~SLY2308~AB
EndOfInput

Sample Output:

GRF9110~Parvati Patil~10.0
HUF7201~Gwenog Jones~0
RAV4308~Olive Hornby~6.0
RAV4309~Angelina Johnson~8.0

4. Find the longest palindrome

As we all know, a *palindrome* is a word that equals its reverse. Here are some examples of palindromes: malayalam, gag, appa, amma.

We consider any sequence consisting of the letters of the English alphabet to be a word. So axxb,abbba and bbbccddx are words for our purpose. And aaabbaaa, abbba and bbb are examples of palindromes.

By a *subword* of a word, we mean a contiguous subsequence of the word. For example the subwords of the word abbba are a,b, ab, bb, ba, abb, bbb, bba, abbb, bbba and abbba.

In this task you will given a word and you must find the longest subword of this word that is also a palindrome.

For example if the given word is abbba then the answer is abbba. If the given word is abcabcabbacba then the answer isbcabbacb.

Solution hint

Any subword of w that is a palindrome is also a subword when w is reversed.

Input format

The first line of the input contains a single integer N indicating the length of the word. The following line contains a single word of length N , made up of the letters a,b,\dots, z .

Output format

The first line of the output must contain a single integer indicating the length of the longest subword of the given word that is a palindrome. The second line must contain a subword that is a palindrome and which of maximum length. If there is more than one subword palindrome of maximum length, print the one that is lexicographically smallest (i.e., smallest in dictionary order).

Test Data:

You may assume that $1 \leq N \leq 5000$. You may further assume that in 30% of the inputs $1 \leq N \leq 300$.

Example:

We illustrate the input and output format using the above examples:

Sample Input 1:

5
abbba

Sample Output 1:

5
abbba

Sample Input 2:

12
abcabcabbacba

Sample Output 2:8 bcabbacb

5. A mail is treated as spam when the percentage of spam sentences in the content of mail is more than 30%. A list of spam sentences are:

Act now! Don't hesitate!	Click below	Free access
Additional income	Click here link	Free cell phone
Addresses on CD	Click to remove	Free consultation
All natural	Click to remove mailto	Free DVD
Amazing	Compare rates	Free grant money
Apply Online	Compete for your business	Free hosting
As seen on	Confidentially on all orders	Free installation
Auto email removal	Congratulations	Free investment
Avoid bankruptcy	Consolidate debt and credit	Free leads
Be amazed		

A text file with some content is passed as input to the program.

Write a python program that accepts this input text file, processes the content and determines whether this text file is treated as spam or not.

6. Given a word, find lexicographically greater permutation of it. For example, lexicographically next permutation of "gfg" is "fgg" and next permutation of "acb" is "bac".

Sample Input:

```
bfajihgedc
```

Sample Output:

```
bfcadeghij
```