Python for Computational Problem-Solving

PCPS Lab Exam -1 Questions for Chemistry Cycle

Lab4 - Program questions on Input, Output, and Operators:

1) Write a Python program that checks if a given non-negative integer from the user, is a palindrome. A palindrome is a number that remains the same when its digits are reversed. For example, 121 is a palindrome because it reads the same forward and backward, whereas 1231 is not a palindrome.

2) Write a program that takes number of rows ‘n’ as input and prints the following pattern. For n=4, it is,

   1

   121

   12321

   1234321

3) Write a program that takes number of rows ‘n’ as input and prints the following pattern, for n=4, it is,

   ###1

   ##21

   #321

   4321

4) Write a program that takes number of rows ‘n’ as input and prints the following pattern, for n=4, it is,

   1

   10

   101

   1010

Lab5 - Programs on Lists and tuples and their Combinations:

5) Write a program that takes an integer 'n' as the number of elements to be inserted inside a list. Accept the integer elements for list from the user and an integer 'k' as the desired occurrence frequency from the user. The program should remove all elements that do not occur exactly 'k' times within the list and print the resulting modified list.
   Eg: n=7, input_lst=[10,20,20,30,40,10,50], k=2 Output=[20,20,10,10]

6) Write a program that takes integer 'n' as the number of elements to be inserted inside a list. Accept the integer elements for list, and position 'k' from the user. The program's objective is to find and display the k^{th} smallest number from the list. It is important to note that the numbers in the list may be repeated, and a simple sorting approach may not yield the correct result. The program should handle this case by considering the frequency of each number.
Eg1:-n=6, lst1=[20,7,15,16,7,8], k=3 output=15
Eg 2:- n=5,lst1=[5,4,19,9,18], k=8 output=None

7) Write a program that takes integer 'n' as the number of elements to be inserted inside a list, and the integer elements for list from the user. Modify each element of a list by replacing it with the sum of the next two elements. Assume the list is circular, so the last element will be the sum of the elements at index[0] and index[1].

Eg1:-n=4,lst1=[1,2,3,4] output=[5,7,5,3]

Eg2: n=2, lst1=[100,200], output=[300,300]

8) Write a program that accepts a square 2D list (nested list/like matrix) representing a grid of integers from the user and prints the average of the elements along the main diagonal of the 2D list(nested list).

Eg 1: row_ col= 3, input_lst1=[[1,2,3],[4,5,6],[7,8,9]], output= 5.0 (i.e. (1 + 5 + 9) / 3 =5.0)

9) Write a program that accepts a square 2D list (nested list/like matrix) representing a grid of integers from the user and print the transpose of the 2D list(nested list/like matrix).
Eg 1:- row_col=3 input_lst1= [[1, 5],[2, 7]] Output= [[1, 2],[5, 7]]

Lab6 - Program questions on Combination of Sets, Dictionaries and Strings using functions:

10) Write a program that takes a sentence as input and converts each alphabet in a given sentence to the next letter in the alphabet, while preserving the case of the letters. For example, a is converted to b, b to c, so on and z to a. (ignore punctuations in the input sentence) Eg: inp_str="Welcome to python" output="Xfmdpnf up qzuipm"

11) Write a program to take inputs of different data type as key input and then the value as its data_types name (i.e,. "string", "integer" or "float"). Store the values in a dictionary with key as input and value as data type. Make a sentence with all the inputs which are of string data type and display the same. For example, for the dictionary {"hello":"string", 5:"integer", "world": "string"} the sentence is "hello world".

12) Write a python program that accepts two inputs as word from the user and checks if two words are anagrams of each other. An anagram is a word or phrase formed by rearranging the letters of another.
Eg 1: inp_string 1: anagram inp_string 2: nagaram , Output: True
Eg 2: inp_string 1: baseball, inp_string 2: basketball , Output: False

13) Write a program that accepts word as input from the user and translates that word into Pig Latin. In Pig Latin, words are transformed by moving the first letter to the end and adding "ay." For example, "hello" becomes "ellohay."

14) A cipher is a method of transforming a message to conceal its meaning. The simplest technique involves shifting the letters in the message by a certain number of positions, known as the “shift” or “key”. Given a message and an integer shift value, print the encrypted message. For instance, Encryption - If shift value is 2, A becomes C, B becomes D etc. Z cycles back and becomes B.
Eg1: inp_str=”Hello world” , shift_value=3, Output= Khoor zruog
Eg2: inp_str=” Zero to hero!” , shift_value=1, Output= Afsp up ifsp!

15) Write a Python program that takes a string as input, finds and prints all the unique substrings of the given string in a list in lexicographical order.

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