



**Python for Computational Problem-Solving**

**PCPS Lab Exam -1 Programming Questions for Physics Cycle**

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

- 1) Write a program that takes the number of rows 'n' as input from the user and prints a number pattern in increasing order as shown below. If n is 5, the expected pattern is,

```
1
2 3
4 5 6
11 8 9 10
11 12 13 14 15
```

- 2) Write a program that takes the number of rows 'n' as input from the user and prints a diamond pattern using asterisks (\*) as shown in the sample example. Note that input 'n' will be an odd integer. The pattern should have a diamond shape with 'n' rows in the middle. If n is 5, the expected pattern is,

```
  *
 ***
*****
 ***
  *
```

- 3) Write a program that calculates and prints the Least Common Multiple (LCM) of two positive integers entered by the user.
  - 4) Write a program that prompts the user to input a positive integer, checks if it's a valid positive integer, and then determines whether it's an Armstrong number. If the user enters a negative number or a non-integer value, provide an appropriate message. The program should display whether or not the input is an Armstrong number. An Armstrong number is one where the sum of its individual digits, each raised to the power of the number of digits in the original number, equals the original number (e.g., 153 is an Armstrong number because  $1^3 + 5^3 + 3^3 = 153$ ).
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#### **Lab5 - Programs on Lists and tuples and their Combinations:**

- 5) Write a program that accepts a square 2D list (nested list/like matrix) representing a grid of integers from the user. Calculate and print the sum of the elements along both the main diagonal (top-left to bottom-right) and the secondary diagonal (top-right to bottom-left) of the 2D list (nested list/ like matrix).
- 6) Write a program that accepts a square 2D list (nested list/like matrix) representing a grid of integers from the user. Find and print the maximum value in the entire 2D list (nested list/ like matrix) along with its row and column indices.

- 7) Write a program that accepts a square 2D list (nested list/like matrix) representing a grid of integers from the user. Find and print the minimum value in the entire matrix along with its row and column indices.
  - 8) Write a program that takes an integer 'n' as the number of elements and an integer 'k' as the desired occurrence frequency from the user. The program should remove all elements that occur exactly k times from the list and print the modified list. Both 'n' and 'k' are positive integers and  $k \leq n$ .  
Eg:  $n=7$ , `input_lst=[10,20,20,30,40,10,50]`,  $k=2$     `Output=[30,40,50]`
  - 9) Write a program that takes an integer 'n' as the number of elements 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. Both 'n' and 'k' are positive integers and  $k \leq n$ .  
Eg:  $n=7$ , `input_lst=[10,20,20,30,40,10,50]`,  $k=2$     `Output=[20,20,10,10]`
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#### **Lab6 - Program questions on Combination of Sets, Dictionaries and Strings using functions:**

- 10) Write a program that takes a string 'test\_str' and a substring 'sub\_str' as inputs from the user. Find the sub\_str that occurs the most in a list of words formed by splitting test\_str into words. For Example, if the test\_str string is "This is a test string testtest" and sub\_str is "test". Then the output would be "testtest" as the sub\_str has been repeated twice.
- 11) Write a Python program that takes two strings as inputs from the user and checks if one string is a rotation of another string. For example, "waterbottle" is a rotation of "erbottlewat". Your program should print 'Y' if one string is a rotation of the other, and 'N' if it is not.
- 12) 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.
- 13) Write a Python program that takes two strings as inputs from the user and checks if one string is an anagram of the other string. Your program should print 'Y' if one string is an anagram of the other, and 'N' if it is not. An anagram is a word or phrase formed by rearranging the letters of another word or phrase, using all the original letters exactly once. For instance, if the first string is "listen" and the second string is "silent", the program should print 'Y'. Another example for anagram is "race" and "care" and thus the program should print 'Y' for this input as well.
- 14) Write a Python program that calculates the sum of numerical values assigned to each letter in a given string, where 'a' is assigned the value 1, 'b' is assigned the value 2, and 'z' is assigned the value 26. For instance, if the input string is "hello," the program should calculate the sum

as follows: 'h' (8) + 'e' (5) + 'l' (12) + 'l' (12) + 'o' (15) for a total sum of 52. The program should then display the calculated sum as the result.

- 15) Write a program that takes a sentence as input from the user and converts each alphabet in a given sentence to the next letter in the alphabet, while preserving the case of the letters and prints it. For example, a is converted to b, b to c, so on and z to a. If the input is “Hello, World”, the expected output is “Ifmmp, Xpsme”.

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