Problem Set: List and String Manipulations with Functions and Loops

Task 1: Working with Lists

Write a program that performs the following:
1. Create a list of numbers from 1 to 20.
2. Using a loop, remove all numbers divisible by 3 from the list.
3. Print the updated list.

Task 2: String Analysis

Create a program to analyze a user-provided string:
1. Ask the user to input a sentence.
2. Count and print the number of words in the sentence.
3. Count and print the number of vowels in the sentence.
   (Hint: Use the string method `.lower()` to handle case insensitivity.)

Task 3: Using List Methods

Write a function `find_second_largest(numbers)` that:
1. Takes a list of integers as input.
2. Returns the second-largest number in the list.
3. Handles cases where the list has duplicates of the largest number.

Task 4: String Methods and Loops

Write a function `reverse_and_capitalize(sentence)` that:
1. Takes a string as input.
2. Reverses the order of the words in the string.
3. Converts all the letters in each word to uppercase.
4. Returns the modified string.
Example:
Input: 'hello world'
Output: 'WORLD HELLO'

Task 5: Cumulative Sum in a List

Write a function `cumulative_sum(numbers)` that:
1. Takes a list of numbers as input.
2. Returns a new list where each element at index `i` is the sum of elements from index `0` to `i` in the input list.
Example:
Input: [1, 2, 3, 4]
Output: [1, 3, 6, 10]

Task 6: Average Age and Name Counts

Write a program to process a string containing people's names and ages,where the string is:

“””Ann Smith, 27

John Kowalsky, 29

Ann Brown, 22

John Fitzgerald, 39

Ann Saraton 22

George Brown, 28

Irving Smith, 50

Mark Travolta 40”””

Your program should:
1. Calculate the **average age** of all people.
2. Count how many times each **first name** appears in the string.
3. Count how many times each **last name** appears in the string.
4. Output the average age, first name counts, and last name counts..

Example Input and Output:
Input: 'Ann Smith,27\nJohn Kowalsky,29\nAnn Brown,22\nJohn Smith,30'

Output:
Average Age: 27

First Name Counts:
Ann: 2
John: 2

Last Name Counts:
Smith: 2
Kowalsky: 1
Brown: 1

Task 7: Using Loops with String Methods

Write a program that:
1. Prompts the user for a list of words (comma-separated).
2. For each word:
   - Remove any leading or trailing whitespace.
   - Check if it starts and ends with the same letter (ignoring case).
   - Print the word if the condition is met.

Task 8: Dictionary from List

Write a function `count_occurrences(items)` that:
1. Takes a list of strings as input.
2. Returns a dictionary where the keys are the unique strings, and the values are the counts of each string in the list.
Example:
Input: ['apple', 'banana', 'apple', 'orange', 'banana', 'banana']
Output: {'apple': 2, 'banana': 3, 'orange': 1}

Task 9: Sentence Modifier

Write a function `replace_vowels(sentence, char)` that:
1. Takes a string `sentence` and a character `char` as input.
2. Replaces all the vowels in the sentence with `char`.
3. Returns the modified sentence.
Example:
Input: ('Hello, world!', '*')
Output: 'H*ll*, w*rld!'

Task 10: Sorting and Filtering

Write a function `filter_and_sort(numbers, threshold)` that:
1. Takes a list of integers and a threshold as input.
2. Filters out all numbers less than the threshold.
3. Returns the filtered numbers sorted in descending order.
Example:
Input: ([10, 4, 7, 3, 8, 15], 7)
Output: [15, 10, 8, 7]