Python Review: Strings, Tuples, Lists

Answer the following questions.

1. What is the difference between a tuple and a list in Python?

2. Given the string `s = "PROGRAMMING"`, determine the value of `x` after each command.
    ```
    a. x = s[3]
    b. x = s[2:6]
    c. x = s[::2]
    ```

Write programs that accomplish each task. Use proper conventions for variable names, input prompts, output statements, and program structure. Do not assume that the user will enter the correct data type.

3. Given an arbitrary length string, determine the number of each vowels (AEIOU) it contains, and the total number of vowels. For example, the string OUTDOOR EXERCISE contains 0 As, 3 Es, 1 I, 3 Os and 1 U, for a total of 8 vowels. Vowels may be upper- or lowercase.

4. An anagram is a rearrangement of the letters of a word or phrase. For example, TOP and POT are anagrams, but RATS and STIR are not (different letters). Determine if two user-entered strings are anagrams of each other. Watch out for repeating letters, e.g. POLO and LOOP.

5. Generate a list of 10 random integers, and determine the length of the longest run of ascending values. For example, the sequence 3, 7, 1, 8, 2, 5, 5, 7, 3, 9 has a run of 4 (2, 5, 5, 7).

6. Have the user enter an arbitrary number of integers into a list. Remove all values that occur more than once. Of the remaining values, count the ones that are between 10 and 20. For example, the sequence 4, 12, 15, 3, 15, 17, 27 would become 4, 12, 3, 17, 27 (15 is removed), and there are two values between 10 and 20 (12 and 17).

7. Read an arbitrary number of integers from the user, then determine the mean (average), median (middle value, when arranged in ascending order) and mode (most commonly occurring value). For example, the integers 1, 5, 7, 7, 8, 2 have a mean of 5, a median of 6, and a mode of 7.

8. The **Sieve of Eratosthenes** is a technique for finding prime numbers. Start with a list of integers, 2-*N*. Since 2 is the smallest value in the list, scan through the list and mark every multiple of 2 as a composite number. For example, the values 4, 6, 8, and so on will be eliminated. The next smallest value that has not been eliminated is 3. Mark off every multiple of 3, starting with 6, 9, 12, and so on. The next smallest value that has not been eliminated is 5. Repeat this process until there are no more values to eliminate. The remaining values (2, 3, 5, 7, 11, etc.) are all prime. Given an integer *N*, determine the number of primes strictly less than *N*. For example, there are ten prime numbers less than 30.