LAB ASSIGNMENT # 06

String

BRAC UNIVERSITY

Inspiring Excellence

CSE110 | Programming Language I

	LAB TASKS	HOME TASKS
CODING	06	05
TRACING	01	02

NOTE: You need to submit only the Home Tasks. Submit all the Flowchart or Tracing tasks hand drawn or handwritten, respectively to your Lab Instructors before the next lab. Submit all the Homework Coding Tasks in the Google Form shared on buX.

LAB TASKS

[NO NEED TO SUBMIT]

Question: 1

The gaming community has updated its gift card redemption process to prevent increasing theft incidents. From now on, when a player receives a redeem code from the seller, the actual code that must be entered on the redemption platform is obtained by changing the case of every vowel in the original code: any uppercase vowel (A, E, I, O, U) must become lowercase, and any lowercase vowel (a, e, i, o, u) must become uppercase, while all other characters (consonants, numbers, special symbols, etc.) must remain exactly the same. You are required to write a complete Java program that reads a single line containing the original code entered by the user and outputs the transformed code that can be directly used for successful redemption.

Sample Input	Sample Output
Code: 9Abe-Coal-69UK-420i	Redeemable Code: 9abE-COAl-69uK-420I

Question: 2

At BRAC University, the CSE110 Student Tutors (STs) prepared a unique puzzle for the upcoming lab exam. They explain that Professor McGonagall from Harry Potter had recently visited their department and, during her session, wrote two strings on the whiteboard.

The STs tell the students:

“Professor McGonagall mentioned that these two strings share a common beginning.Your task is to find the longest common prefix between them.”

Now the STs want you to uncover this longest common prefix hidden between the given two strings, meaning: the longest sequence of characters that appears at the beginning of the given strings.

Sample Input	Sample Output
String1:Flower String2:Flow	Flow
String1:Car String2:Racecar	There is no common prefix between the input strings.

Question: 3

While searching Hopper’s cabin, you find a torn page from his investigation notes. Half the message is missing, and the remaining text is scrambled together into a single string. Hopper left clues in the margins that tell you exactly which part of the string you need to extract in order to reconstruct the important information. Your job is to manually slice the string, to rebuild Hopper’s original message.

Sample Input	Sample Output
text: d3mgxHopperwasHere7bq startIndex: 5 endIndex: 17	HopperwasHere

Question: 4

You are creating an application for social media users. Often, when users type content or create hashtags, they may accidentally repeat letters in words and use unusual special characters instead of spaces, making the text hard to read. Your task is to develop a program that can clean up these hashtags. The program should first read a string from the user, which may contain multiple words separated by a user specified character. Next, it should read the character that separates the words in the string and use it to split the string into individual words. For each word, the program should remove any duplicate letters while keeping only the first occurrence of each letter. Finally, the program should print all the cleaned words.

Sample Input	Sample Output
Codingggg-is-funnnn -	The words are: Coding is fun
Soociial#Meddiiaa #	The words are: Social Media

Question: 5

A scrambled message has come through the static on the Hawkins radio. Dustin believes it’s a secret transmission from Eleven, but it has been encoded using a strange Upside Down cipher. You need to write code that can decipher the message from the Upside Down so that it is readable in Hawkins. Every character in the Upside Down has been shifted +1 in ASCII.

For example:

- ‘b’ in the Upside Down means ‘c’ in Hawkins
- ‘z’ in the Upside Down means ‘a’ in Hawkins

However, there are a few extra rules that must be applied based on the table below:

Upside Down	Hawkins
^	v
3	e
@	a
_	space

NOTE: You can assume that there will be no other characters except those listed above and the 26 lowercase English letters.

Sample Input	Sample Output
Upside Down: ^3bm@_hr_bnlhmf	Hawkins: vecna is coming
Upside Down: lzw_@mc_gnkkx_hr_rstbj	Hawkins: max and holly is stuck

Question: 6

BRACU’s Connect marks entry system has a bug that causes every student’s mark to be stored as a string instead of a number. For example, if a faculty member enters the mark 85, the system stores it as "85". Now you have to design a java program which will convert this string value back into its correct integer form before adding the mark to the grade sheet. Then print the grade. You are only allowed to use .length(), .charAt(), loops, and basic arithmetic operations. [No need to take user-input]

- Marks between 90 to 100 is Grade A
- Marks between 80 to 89 is Grade A-
- Marks between 70 to 79 is Grade B
- Marks between 60 to 69 is Grade C
- Marks between 50 to 59 is Grade D
- Less than 50 is Grade F

Sample Input	**Sample Output**
“55”	D
“88”	A-
“101”	Invalid Mark

Question: 7

Trace the following code, create a tracing table and write the outputs.

```java
public class HWTracing01 {
    public static void main(String[] args) {
        int x = 0, y = 0;
        String sum = "0";
        double p;
        while (x < 9) {
            y = x / 2;
            while (y < x) {
                p = (x + 5.0) / 2;
                sum = (sum + 2) + x + "y * 2" + (int) p ;
                System.out.println(sum);
                y = y + 1;
            }
            x = x + 2;
            if (x > 5) {
                sum = "2";
            } else {
                sum += "3";
            }
        }
    }
}
```

HOME TASKS

Question: 1

A secret meeting of agents is scheduled, and entry requires a 2-digit PIN. To keep the PIN confidential, the mission leader has hidden it inside a sentence. The rule is simple: the largest two-digit number present in the sentence will serve as the PIN. You, being the only Java programmer in the team, are tasked with writing a Java program that:

- Takes a sentence (a single line of text) as input from the user.
- Scans the entire sentence to find all two-digit numbers (from 00 to 99) embedded within it.
- Identifies the highest (maximum) two-digit number among them.
- Outputs that number as the PIN.
- If no two-digit number is found in the sentence, the program should output 0 as the default PIN.

Sample Input	Sample Output
Message: Class will start at 14:00. Room Number: 09B-10L	2-Digit PIN: 14
Message: There will be no class today	2-Digit PIN: 0

Question: 2

Given a string s consisting of printable ASCII characters, reverse only the vowels in the string while keeping all other characters (consonants, spaces, punctuation, etc.) in their original positions. The vowels are defined as 'a', 'e', 'i', 'o', 'u' (both lowercase and uppercase). Return the modified string after reversing the vowels.

Note:

- Vowels can appear multiple times and in any case.
- The string may contain non-alphabetic characters, which should remain unchanged.
- The string is guaranteed to have a length of at least 1.

Sample Input	Sample Output
Brac University	Bric enivUrsaty
AEIOU	UOIEA

Question: 3
In the magical world of Harry Potter, the Sorting Hat wants to find the most "powerful" (longest) spell name from several one word spells that students whisper during the Sorting Ceremony. Each student whispers a spell one by one. The students keep whispering spells one by one until one of them shouts “stop”(case-sensitive), which signals the Sorting Hat to stop listening. However, some students are mischievous and add weird symbols, extra spaces, or uppercase letters to confuse the Sorting Hat.The Sorting Hat will Ignore all non-letter characters (keep only uppercase letters and lowercase letters), then it will convert it to Upper case letters.

Find the longest spell name whispered and If two spell names are the same length, choose the first one whispered. Also, calculate the power level of the spell as the sum of ASCII values of its letters.

Sample Input	**Sample Output**
Names of the spells: Ac##cio Lumos 99 Expe**lliarmus* 56Crucio56 stop	Largest Spell : EXPELLIARMUS Power Level : 923
Names of the spells: E piskey Engorgio123 stop	Largest Spell : ENGORGIO Power Level : 602

Question: 4

The media team is preparing for the massive upcoming match between Real Madrid and Manchester City. Fans from around the world have submitted short prediction messages through a web form. Each message mentions one or both teams, and your task is to analyze these predictions to help journalists prepare match statistics. Your program will process one fan message and determine:

- Which team is mentioned more (Madrid or City)
- Whether the fan thinks the game will be close or one-sided based on specific keywords (Close and Destroy)
- Whether the message contains positive or negative sentiment for the teams (Based on the keywords)

NOTE: You can assume there will be no characters other than the english alphabets A-Z, a-z, space, ! and .

Sample Input	Sample Output
Fan Message: I think Madrid will score first but City has a strong squad. It will be a close one! Hala MADRID!	Madrid Supporter Fan expect a close match
Fan Message: Madrid has lot of stars and can win. However City can be the dark horse here.	Neutral Hard to read the fan sentiment
Fan Message: City has Pep so they are going to destroy Madrid. Lastly city is going to be the champion this time!	City Supporter Fan expects a dominating victory!
Explanation Sample Case-1: In the message we can find Madrid twice and City once, Therefore the fan is Madrid supporter. And there is the keyword close so the message shows Fan expects a close match	

Question: 5

You are given a string that consists of one or more words separated by spaces. Your task is to determine and return the length of the last word in the string. A word is defined as a maximal sequence of consecutive non-space characters.
Note:

- The string may contain leading spaces, trailing spaces, or multiple spaces between words.
- The string is guaranteed to contain at least one word.
- The string consists only of English letters and spaces.

Sample Input	Sample Output
Hello World	5
A Blessing in Disguise	8

Question: 6

Trace the following code, create a tracing table and write the outputs.

```java
public class HWTracing02{
    public static void main(String[] args) {
        int test = 1;
        int j = 0, k = 100;
        while (k > 0){
            String s = "-->" + (k - 5) + "<--";
            while (j < k ){
                test = k - j + 11;
                s = 1 + test / 3 + s + 4 + 3;
                System.out.println(s);
                j += 10;
                s = "<--" + (j - 5) + test + "-->";
            }
            k -= 10;
        }
    }
}
```

Question: 7

Trace the following code, create a tracing table and write the outputs.

```
public class tracing1{
   public static void main(String[] args) {
       String s = "CSE110";
       int count = 0;
       for (int i = 1; i < 3; i++) {
           for (int j = 0; j < 4; j++) {
               if (j == 2) {
                   continue;
               }
               s +="-" + (i*3.0) + ":" + (int)(j/2.0);
               System.out.println(s);
               count++;
               if (count == 6) {
                   break;
               }
           }
           if (count == 6){
               break;
           }
           if (i % 2 != 0) {
               s += "*";
           }
       }
   }
}
```

UNGRADED TASKS

Question: 1

You are a secret agent tasked with encoding messages for secure transmission. To encode a message, you are given two strings: the message (the original text to send) and the key (a secret key phrase). Create the encoded string by merging the characters from the message and the key alternately, starting with the first character of the message. If one string is longer than the other, append the remaining characters from the longer string to the end of the encoded string. Return the encoded string.

Note:

- Both strings consist of printable ASCII characters (may include letters, digits, spaces, or punctuation).
- The strings can be of different lengths.

Sample Input	Sample Output
Message: secret Key: agent	sagecrenett *Explanation: Merging alternately: 's' (from message) + 'a' (from key) + 'e' (message) + 'g' (key) + 'c' (message) + 'e' (key) + 'r' (message) + 'n' (key) + 'e' (message) + 't' (key) + 't' (message remaining).*
Message: hello Key: worldwide	hweolrllodwide *Explanation: Merging alternately until "hello" ends, then appending the remaining "wide" from "worldwide".*

Question: 2

In the world of Stranger Things, mysterious signals have begun appearing near Hawkins, and Eleven discovers that they are coming from the Upside Down. These signals are made of strange glowing energy pulses, each represented by a single character. While exploring, Eleven records how many times each pulse appears, but the Upside Down transmits this information in a compressed format.

The signals follow a pattern: whenever a pulse repeats, the Upside Down sends it as k[c], where k is a positive integer indicating how many times the pulse occurred, and c is the single-character pulse symbol. Several such patterns may appear in a row, such as 3[x]4[e]2[d].

Now Eleven needs your help to decode this encoded signal and reconstruct the exact sequence of pulses being sent from the other dimension. Your task is to take the encoded string and expand it into the complete signal.

Input Format:

- The input consists of a single encoded string.
- Each encoded segment is in the form k[c], where k is a positive integer and c is a single-character energy pulse.
- Multiple segments may appear consecutively (e.g., 2[h]5[o]1[p]).
- You must return the fully decoded pulse sequence.

Sample Input	Sample Output
2[h]5[o]1[p]	hhoooooop

Question: 3

A mysterious traveler embarked on a journey to a faraway island known for its strange magical properties. On this island, he discovered countless magical words, each carrying a hidden score that determines one’s fate.

According to the island’s ancient rule:

“The score of a word is the sum of the absolute differences between the ASCII values of every pair of adjacent characters in that word.”

If the score of a magical word is divisible by 5, the traveler will be able to leave the island safely and return home.
But if the score is not divisible by 5, he will remain trapped on the island forever.

Your task is to help the traveler determine his fate.

Sample Input	Sample Output
Input: s = "zaz"	Hurray! The mysterious traveler is going home!! Explanation: The ASCII values of the characters in s are: 'z' = 122, 'a' = 97. So, the score of s would be |122 - 97| + |97 - 122| = 25 + 25 = 50. Since 50 is divisible by 5, the traveler will return home safely.
Input: s = “hello”	Oh no!! The mysterious traveler will be stuck on the island!! Explanation:The ASCII values of the characters in s are: 'h' = 104, 'e' = 101, 'l' = 108, 'o' = 111. So, the score of s would be |104 - 101| + |101 - 108| + |108 - 108| + |108 - 111| = 3 + 7 + 0 + 3 = 13. Since 13 is not divisible by 5, the traveler will remain stuck on the island.

Question: 4

You are playing a magic-battle game against Doctor Doom whose health starts at 100. You will be given 5 chances to cast a spell. Each spell is entered as a String. Now, these are the rules of this game:

1. If the total ASCII value of the whole spell is odd, Doctor Doom loses 50 health, but if it is even, Doctor Doom gains 25 health
2. If the spell length is less than 3 characters, it is considered a “weak spell” and Doom instantly gains 10 health (ignore odd/even rule for that round).
3. If the ASCII total is also divisible by 3, Doom activates a shield and gains an extra 10 health (this applies after the above rule).
4. Doom’s health can never go above 200. If it does, set it back to 200.

After all five spells are processed, print “You won” if his health is 0 or below; otherwise print “You Lost”. . You are only allowed to use .length(), .charAt()

Sample Input	Sample Output
Expelliarmus Accio Lumos Expecto Patronum Avada Kedavra	You Lost
messi Ronaldo neymar mbappe yamal	You won

Question: 5

During your CSE110 lab exam, you and your friend try to communicate secretly. To get this, you decide to use a coded messaging system with your friend but there are some hidden rules which you only shared with your friend:

- every + adds the previous character again
- - represents a space
- # moves the message to a new line
- % repeats the next character three times
- . indicates the end of the message and stops decoding.

Additionally, if the program encounters any digits (0-9) or spaces or any other special characters, it should ignore them completely and not include them in the decoded message. Your task is to write a Java program that reads such a coded message character by character and outputs the decoded message according to these rules.

Sample Input	Sample Output
`me+et-me-#after#clas+.`	meeet me after class

Question: 6
Write a Java program that takes a string as input and determines whether the string qualifies as a strong password. A strong password is defined by the following criteria:

- The password must be at least 8 characters long.
- The password must contain characters at least one -
  - Uppercase letters (A-Z)
  - Lowercase letters (a-z)
  - Digits (0-9)
  - Special characters (e.g., !, @, #, $, etc.)

Print ‘True’ if the password is strong, and ‘False’ otherwise. You may consider any character excluding the alphabet, digit, and space as special characters.

Sample Input	Output
StrongPass123!	True
Weak123	False

Question: 7
Write a Java program that takes a sentence as user input and displays the sentence in aLtErNaTiNg CaPs format. Note that, you have to ignore spaces and other punctuations while altering the characters. Also, your new sentence will always start with lowercase letters.

Sample Input	Output
Hello World!	hElLo WoRlD!
I love Java String Problems. Those are easy.	i LoVe JaVa StRiNg PrObLeMs. ThOsE aRe EaSy.

Question: 8
Write a Java program that takes a string as input and reverses the order of words in it.

Sample Input	Output
CSE110 is easy	easy is CSE110
Attention please!	please! Attention