

CS100 Computational Problem Solving

Fall 2019-20

Section 1
Tuesday, 08 October 2019

Lab 06: Exercise

Lab Guidelines

1. Make sure you get your work graded before the lab time ends.
2. You put all your work into the folder **Lab6_YourRollNo_TName** and submit it on LMS (Assignment>Lab6) before the time the lab ends.
3. Talking to each other is NOT permitted. If you have a question, ask the lab assistants.
4. The object is not simply to get the job done, but to get it done in the way that is asked for in the lab.
5. Phone is NOT allowed. Put it in bag or at instructor desk.
6. Any cheating case will be reported to Disciplinary Committee without any delay.

Coding Conventions:

1. Constants are ALL_CAPS.
2. Variables are all_small.
3. All curly brackets defining a block must be vertically aligned.

Learning Objective:

1. PO-02 Develop proficiency in the practice of computing.
2. CO-02 To help students analyze and solve programming problems
3. LO-02 Critical Thinking and Analysis
4. LO-03 Problem Solving
5. LO-05 Responsibility

Marks: Name: _____ Roll #: _____

Task1									Total
									25

Task2									Total
									25

Task 3									Total
									25

Task 4									Total
									25

Total Marks
Obtained

/100

TA: _____

Let's Begin

Task 1:**[25 marks]**

Kathy is a researcher, who is working with a machine that generates 5-characters long string code. She does not want to store it as it is rather would like to encrypt the strings. She has asked you to write a program that will take a 5-characters long string as an input and encrypt that string in the given specified format.

You will have to see the characters at the odd location of the string and if those characters are vowels, then you are required to replace those characters with _ (underscore).

Examples:

1. "kalpm" should be encrypted as "k_lpm".
 2. "kalem" should be encrypted as "k_l_m".
 3. "ktlpm" should remain the same because odd number characters are not vowels.
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Task 2:**[25 marks]**

Consider four kinds of shapes:

1. Rectangle: Only opposite side are equal, all angles 90 degrees
2. Square: All sides are equal, all angles 90 degrees
3. Rhombus: All sides are equal, no angle is 90 degrees
4. Rhomboid: Two pairs of parallel sides, two pairs of sides equal in length, no angle is 90 degrees

Write a program that asks the user relevant questions in order to guess one of the four-sided shapes given. Phrase all questions such that the user should only answer in terms of "YES" or "NO."

Note: Use Boolean variables in your program.

Sample output:

Q: Are all sides equal?

A: YES

Q: Are all angles 90 degrees?

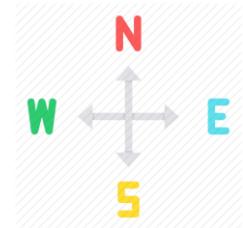
A: NO

It is a rhombus!

Task 3:**[25 marks]**

A game developer has hired you to help him with his new game. You have to write a program which takes the user's initial location as an input and stores it in the form of X and Y coordinates. As the user take a step in some direction, the program asks him/her to press N,S,E, or W keys in case of North, South, East or West direction respectively. The program now should simply display the updated location of the user in the game. The location displayed must be in the form of updates X and Y coordinates.

Note: Use switch case statements.

**Task 4:****[25 marks]**

Write a C++ program that takes in 3 real numbers and find all roots of a quadratic equation, using switch case, onto the screen. Make sure that your program works correctly for both negative and positive integers. If user gives the wrong input, then it should print some error on the screen, so do validate the user input in the beginning of your program.

Note: Use of If-else statements in this section is prohibited.

Discriminant of the quadratic equation is given by:

$$\Delta = b^2 - 4ac$$

If discriminant is positive. Then there are two real distinct roots given by:

$$\frac{-b + \sqrt{\Delta}}{2a} \quad \text{and} \quad \frac{-b - \sqrt{\Delta}}{2a}$$

If discriminant is zero. Then it has exactly one real root given by:

$$-\frac{b}{2a}$$

If discriminant is negative. Then it will have two distinct complex roots given by:

$$\frac{-b}{2a} + i \frac{\sqrt{-\Delta}}{2a} \quad \text{and} \quad \frac{-b}{2a} - i \frac{\sqrt{-\Delta}}{2a}$$

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Enter first number:
4
Enter second number:
-2
Enter third number:
-10
Input is correct

Two distinct and real roots exists: 1.85078 -1.35078
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