

CS100 Computational Problem Solving

Fall 2019-20

Section 1

Tuesday, 19 November 2019

Lab 12: 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 **Lab12_YourRollNo_TAname** and submit it on LMS (Assignment>Lab12) 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
									15

Task2									Total
									25

Task 3									Total
									30

Task 4									Total
									30

Total Marks
Obtained

/100

TA: _____

Let's Begin

Task 1:**[15 marks]**

Write a recursive program that reverses an input string.

Input String: Hello

Output String: olleH

Task 2:**[25 marks]**

Write a program in C++ to convert a decimal number to binary using recursion.

Input any decimal number: 66

The Binary value of decimal no. 66 is: 1000010

Task 3:**[30 marks]**

Write a recursive program to print the Hailstone sequence from a given input number to 1. Also print the number of steps required to generate the sequence.

In the **Hailstone sequence** each term is obtained from the previous term as follows:

If the previous term is even, the next term is one half the previous term. If the previous term is odd, the next term is 3 times the previous term plus 1.

Test Case:

```
Enter a number:
45
45 136 68 34 17 52 26 13 40 20 10 5 16 8 4 2 1
steps = 17
-----
```

Task 4:**[30 marks]**

Write a program in C++ to calculate the value of nCr or nPr . You will first ask the user of what operation to perform, **valid inputs for operation would be "C", "P" or "Q"** (where Q is the command to quit). Then take inputs for n and r . You will make 3 functions, one function **factorial(n)** (which will calculate the factorial value) and the other two functions will be **C(n, r)** and **P(n, r)**. Remember that for the formulas nCr and nPr to work, **n or r cannot be less than 0** and **r cannot be greater than n .**

$$nCr = \frac{n!}{r! \times (n-r)!}$$

$$nPr = \frac{n!}{(n-r)!}$$

$$n! = n \times (n-1) \times (n-2) \times \dots \times 2 \times 1$$

- You are expected to handle all possible errors.
- **Please make sure that your program does not terminate after displaying errors.** Instead it should keep taking user input **in the main**, display the corresponding result/error **in the main** and finally **terminates only when the user provides Q as the value for choice**.
- You're are not required to implement recursion anywhere in this question.

```
Operation to be performed: C
Enter value of n: 5
Enter value of r: 3
5C3 = 10
Operation to be performed: Q
Quiting Program.
```
