NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES ISLAMABAD CAMPUS

CS-1002 Programming Fundamentals Fall-2023

ASSIGNMENT-01

Section (A, B, C, D, E, F and G)

Deadline: 21st September 2023 03:00 PM

Instructions:

- For each question in your assignment, make a separate cpp file e.g. for question 1, make ROLL-NUM_SECTION_Q#.cpp (23i-0001_A_Q1.cpp) and so on. Each file that you submit must contain your name, student-id, and assignment # on top of the file in comments.
- Combine all your work in one folder. The folder must contain only .cpp files (no binaries, no exe files etc.).
- Rename the folder as ROLL-NUM_SECTION (e.g. 23i-0001_A) and compress the folder as a zip file. (E.g. 23i-0001_A.zip). Do not submit .rar file.
- All the submissions will be done on Google classroom within the deadline. Submissions other than Google classroom (e.g. email etc.) will not be accepted.
- The student is solely responsible to check the final zip files for issues like corrupt files, viruses in the file, mistakenly exe sent. If we cannot download the file from Google classroom due to any reason, it will lead to zero marks in the assignment.
- Displayed output should be well mannered and well presented. Use appropriate comments and indentation in your source code.
- **Be prepared for viva or anything else after the submission of assignment.**
- If there is a syntax error in code, zero marks will be awarded in that part of assignment.
- Understanding the assignment is also part of assignment.
- **The AIM of this assignment is to give you practice with arithmetic, bitwise and ternary operators. Zero marks will be awarded if advance topics (e.g., if else, loops & arrays etc.) used. Do not use any built-in function other than pow , log (#include <cmath>) setw and setfill (#include <iomanip>).**
- **Zero marks will be awarded to the students involved in plagiarism. (Copying from the internet is the easiest way to get caught).**
- **Late Submission policy will be applied as described in course outline.**

Tip: For timely completion of the assignment, start as early as possible.
Note: Follow the given instruction to the letter, failing to do so will result in a zero.

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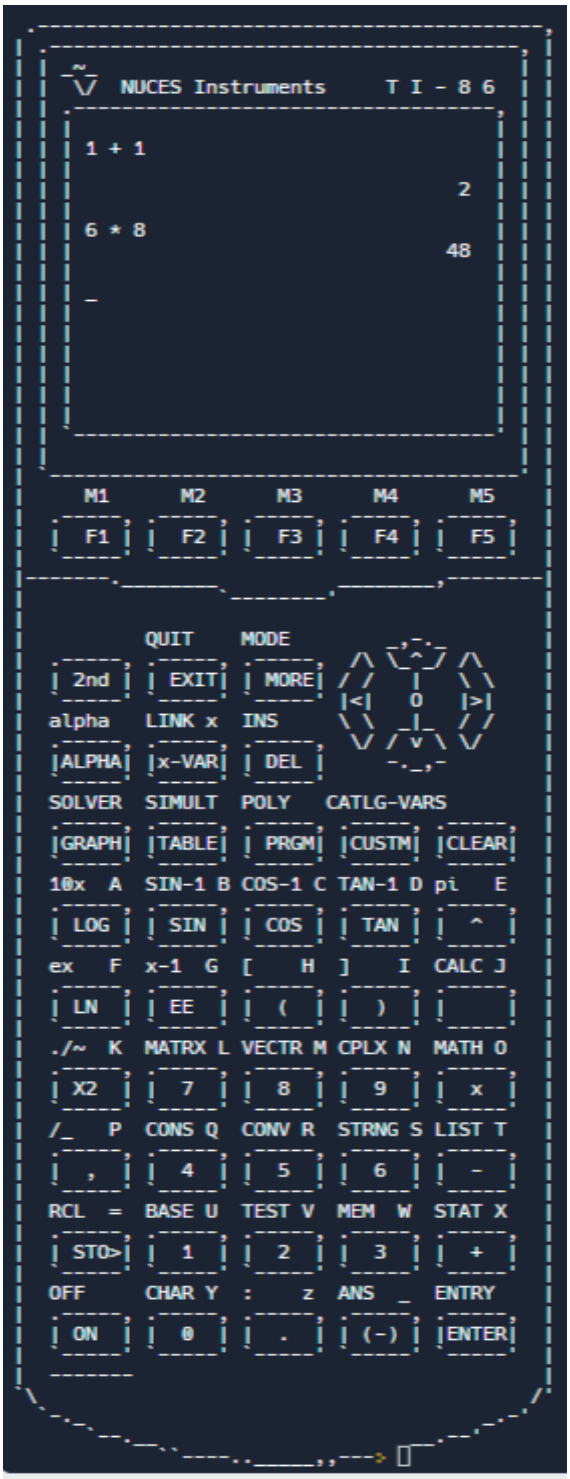
Problem 01: NUCES Calculator

Write a C++ program that outputs the following using only **one cout statement**. Use **setw** and **setfill** for spaces and repeated characters.



Problem 02: Rightmost digit

Write a program that accepts three non-negative integers from the user and print "true" if two or more of them (Integers) have the same rightmost digit.

E.g.

Input the first number: 5

Input the second number: 10

Input the third number: 15

The result is: true

Note: Ternary operator not allowed

Problem 03: Credit Card Loan

$$N = -\frac{1}{c} \cdot \frac{\ln\left(1+\frac{b}{p}\cdot(1-(1+i)^c)\right)}{\ln(1+i)}$$

Whereas:

N = How long it will take to pay off a credit card loan. (float)

c = A constant factor (int : value will be 30).

b = balance (int)

p = monthly payment (int)

i = yearly interest rate/365 (float)

ln = Natural logarithm

Write a program that takes these **c, b, p** and **i** as an inputs and gives an output. Note: use cmath library for pow and log functions.

Problem 04: Bar Chart

Take 5 integer inputs from the user, then display bar chart using '*' char. Hint [use iomanip library]

Input:

N1: 1 N2: 3 N3: 9 N4: 2 N5: 5

Output:

N1: *

N2: * * *

N3: * * * * * * * * *

N4: * *

N5: * * * * *

Note: Ternary operator not allowed. Use only setw() and setfill()

Problem 05: Magic Number

The date June 10, 1960, is special because when we write it in the following format, the month times the day equal the year.

6/10/60

6×10=60

Write a C++ program that asks the user to enter a month (in numeric form), a day, and a two-digit year. The program should then determine whether a month times the day is equal to the year. If so, it should display a message saying the date is magic. Otherwise it should display a message saying the date is not magic.

Problem 06: Quantum Key Generator

Design a Quantum Key Generator for a secure facility with the following requirements:

Input a positive integer (of 32 bits). The integer will contain 3 private gates and 1 Public CONSTANT gate of 8 bits each. Your objective is to find the Quantum Key. The Quantum Key must satisfy the following conditions:

Each key bit when XORed with the respective gate bits must equal the Constant Public Gate bit.

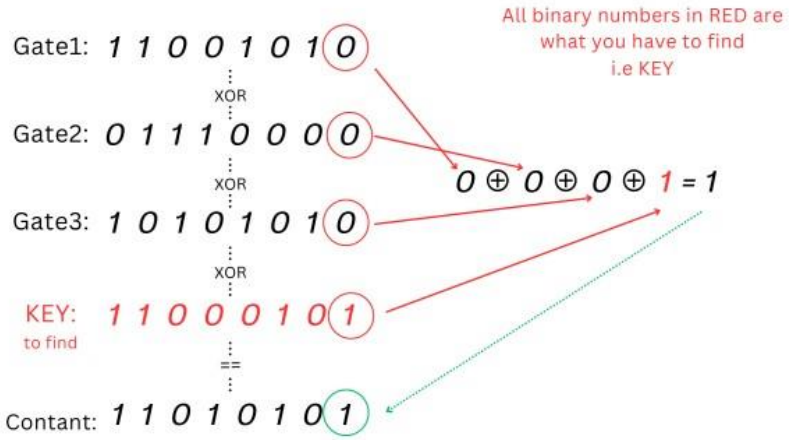
Note:

1. Use Bitwise Operators for Bit Manipulation (no arithmetic and Ternary operators allowed)
2. You must output the key byte in Binary form

An example of this is given below (note that all the bits in one row XORed equal to the same Constant Bit). You must print the Key at the end. **You have to find and display the key.**

Input 32 bit positive number: 3584717002

1 1 0 1 0 1 0 1 Constant	1 0 1 0 1 0 1 0 GATE3	0 1 1 1 0 0 0 0 GATE2	1 1 0 0 1 0 1 0 GATE1



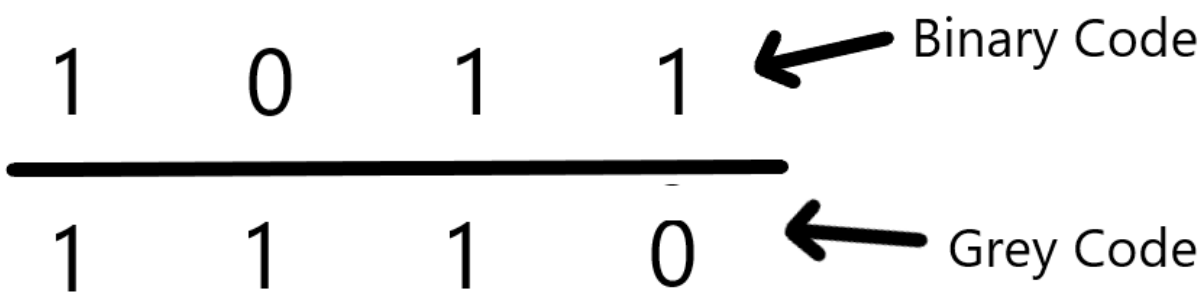
Problem 07: Binary to Grey Code Converter:

Grey codes are binary numeral systems in which neighboring numbers have only one differing bit. For converting a binary code to grey code, we simply record the MLB (Most Left Bit) as it is and then, add MLB to its neighboring bit, record the sum and neglect the carry. Repeat the process. The resulting number will be our grey code. This is how we convert binary code to grey code.

Write a program that takes any non-zero (16 bit) integer from the user and outputs its grey code value in bits.

Note: use only bitwise operators

In the given picture, we record MLB as it is. Then we add 1 and 0, record the sum 1 and neglect carry. And so on.



Problem 08: Bill Calculation

You have started working at a water plant and have been asked to develop a program which can calculate the total water consumption bill. Your program will input the number of gallons from the user and will calculate the total bill according to the following conditions:

- The first 100 gallons for $0.45/gallon
- The next 250 gallons for $0.85/gallon
- The next 250 gallons for $1.45/gallon

For additional gallons above 600 $2.60/gallon

An additional service charge of 14% is also added to the bill.

Your answer should be correct to 2 decimal places.

Note: Ternary operator not allowed

Problem 09:

Given four integers by the user, provide a program that displays the max and second maximum value.

Problem 10: Find the Color

You are given a grid as shown in the figure below. You can determine the color and number of each square from the grid. Write a C++ program that inputs two numbers within the grid range. Your program will determine if the two squares entered in this grid have the same color or not.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

---------- Enjoy Codding because it is a great fun (Bill Gates) ☺ ----------