Programming Fundamentals (CS 1002)
FALL 2022 ASSIGNMENT # 2

Due Date: Wednesday, October 12, 2022 (05:00 pm)

Instructions

Please follow the following submission instructions. Failure to submit according to the above format would result in a deduction of 10% marks. Submissions other than Google classroom (e.g., email etc.) will not be accepted.

- Combine all your work (solution folder) in one .zip file. Use a proper naming convention for your submission file. Name the .zip file as **PROGRAM SECTION_ROLL-NUM_02.zip** (**e.g., BS(DS/AI)_A_22I_1234_02.zip**). Your zip file should only contain **.cpp** files, and each file should correspond to its question/problem number. Submit a .zip file on Google Classroom within the deadline.
- The student is solely responsible for checking the final .cpp file for issues like corrupt files, viruses in the file, or mistakenly exe sent. If we cannot download the file from Google Classroom, it will lead to zero marks in the assignment.
- The displayed output should be well-mannered and well presented. Use appropriate comments and indentation in your source code.
- If there is a syntax error in the code, zero marks will be awarded in that part of the assignment.

Deadline: The deadline to submit the assignment is **Wednesday, October 12, 2022 (05:00 pm)**. No late submission will be accepted. Correct and timely submission of the assignment is the responsibility of every student; hence no relaxation will be given to anyone.

Grading Policy

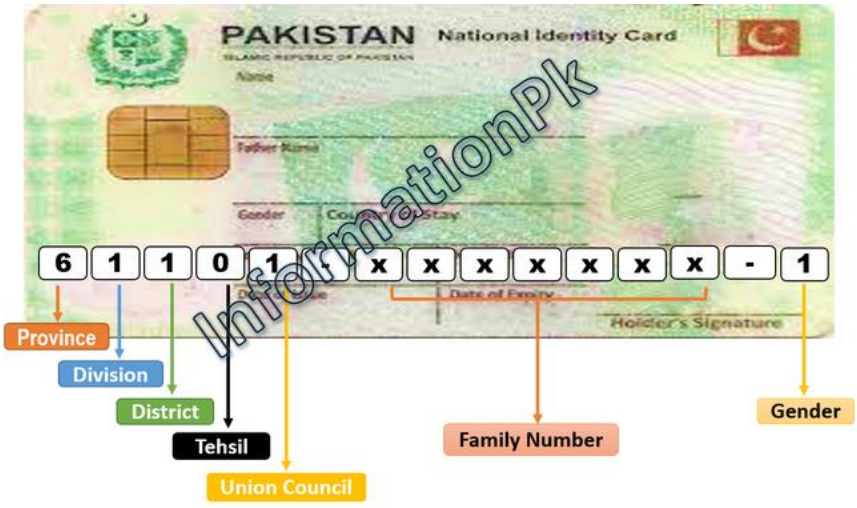
1. Program with no compiler error (10%)
2. Functional requirements (50 %)
3. Good user interface (user-friendly instructions, layout, presentation) (15%)
4. Proper source code indentation (10%)
5. Programming conventions followed (e.g., variable names) (15%)

Honor Policy

This assignment is a learning opportunity that will be evaluated based on your ability. Plagiarism cases will be dealt with strictly. If found plagiarized, both the involved parties will be awarded zero marks in this assignment, all the remaining assignments, or even an **F grade** in the course.

Note: Start early so that you can finish it on time**.**

Problem 1: 20 years ago, FAST Islamabad campus used to store student's CNIC numbers only, to uniquely identify them. The administration decided that they should expand its information keeping facilities, and store other information about the students as well, such as their gender, the province, division, tehsil and union council they belong to, and their family number.



Your Task is to write a C++ Program which inputs a CNIC number, and a string Name of the student. Your Program will separate the relevant info and prints the information in the following manner.

```
Enter Name of Student:  Hamza
Enter ID of Student:  6110166903075


Gender of Hamza is: Male
Province of Hamza is: Islamabad
Division of Hamza is: Islamabad-1
District of  Hamza is: Islamabad-1
Tehsil of  Hamza is: Islamabad-1
Union Council of Hamza is: Islamabad-1
Family Tree of Hamza is: 6690307
```

Problem 2: Implement a game of hi-lo. First, your program should pick a random integer between 1 and 100. Your solution should handle invalid guesses (e.g. 'x'), out of bounds guesses (e.g. 0 or 101), or valid guesses that have extraneous characters (e.g. 69x). The user is given 5 tries to guess the number.

If the user does not guess the correct number, the program should tell them whether they guessed too high or too low. If the user guesses the right number, the program should tell them they won. If they run out of guesses, the program should tell them they lost, and what the correct number is.

Problem 3: You were orphaned at an early age. To make ends meet, you sought work in a local toy car workshop in your city, and your job is to build toy cars from a collection of parts. Each toy car needs 4 wheels, 1 car body, and 2 figures of people to be placed inside. You notice that sometimes, you'll get orders of the number of cars to make, but you won't have the total required parts available. To prevent this, you want to find out how many *complete* toy cars can you make, given the total number of wheels, car bodies and figures available at hand currently.

Problem 4: A shape with four vertices and sides is known as a quadrilateral. Square, rectangle, kite, rhombus, trapezium, and parallelogram are all quadrilaterals. Write a C++ program for guessing the type of the quadrilateral. Your program should guess correctly, in case of incorrect input, display appropriate message. Phrase all questions in a way that user must enter some boolean value Y/N as an answer. Both Y/y are treated as 'Yes'.

Example:

Think of a quadrilateral from square, rectangle, kite, rhombus, trapezium and parallelogram and I will guess it....

Let's start

[Optional: you can place counter here like display 3, 2, 1....]

Q1. Are all sides equal? (Y or N) Y

Q2. Are all angles 90 degrees? (Y or N) Y

I got it! It's a SQUARE.

Problem 5: Imagine your developing software that requires the user to enter the password. Your software requires that user's password meet the following criteria.

a. The password should be at least six characters long.
b. The password should contain at least one uppercase and at least one lower case letter.
c. The password should have at least one digit.

Write a program that ask for the password and then verifies that it meets the stated criteria.

Problem 6: Check whether a given number is the power of 2 or not using bitwise operator. Remember a binary number that is a power of 2 has only 1 bit = 1 in their binary representation. e.g. 2 = 0010, 4 = 0100, 8 = 1000, 16 = 10000, 32 = 100000, 64 = 1000000.

Problem 7: Check whether a number is even or odd **WITHOUT** using loops, arithmetic operators, and comparison operators.

Problem 8: You are working at an embedded systems software. Your primary goal is speed, and you are researching on ways to optimize the overall speed and responsiveness of the system. You notice that whenever you perform multiplication or division, your program takes a longer than desired time to do it. You are researching on ways to increase this speed, as a core functionality of your program is computing the average of numbers. Your goal is to find the average of two numbers **WITHOUT** using arithmetic operators.

Problem 9: Write a C++ program that gives the largest number using ternary operator among:

1. Three Numbers that is if three numbers are taken as input form user.
2. Four Numbers that is if four numbers are taken as input form user.

Problem 10: Attempt the following by writing C++ code and using conditional operators determine:

a. Whether the character entered through the keyboard is a lower-case alphabet or not.
b. Whether a character entered through the keyboard is a special symbol or not.
c. Write a program using conditional operators to determine whether a year entered through the keyboard is a leap year or not.

*****Good Luck*****