CS1002 –Programming Fundamentals

Assignment # 03
Fall 2023

Deadline: Dec 01, 2023, 4:00 PM

Submission Guidelines:

- Submit your own original work. Plagiarism will not be tolerated, either done from the internet and/or another student.
- Submit **Word File** with Codes and Output Snippets
- **.cpp files**
- Proper naming convention is **mandatory** (Or will be awarded 0)
- **Roll NO_A1_task no.** (Naming convention of Tasks, Example **23F-XXXX_A1_Task_no1**)
- **Roll NO_Name_A1** (Naming convention of Folder, Example **23F-XXXX_Nelayn Abbas_A1**)

Q.No.1:

Declare a matrix of 20x20 characters, initialized with null character. Ask the user to input a number and then the pattern of the user choice will be populated in the matrix. The user can opt any of the below pattern to be populated in the array.

1. Filled Square of *
2. Hollow Square of *
3. Right Triangle of * (It can be any one of the four right triangles)

It should be a menu driven program and will exit when the user enters 0.

Q.No.2:

Inverse of a matrix is a matrix A is a matrix A-1 such that A x A^{-1} = I. Where I, is an identity matrix. You are required to write down a code that will take the input of an n*m matrix A and another m*n matrix B. Will tell if B is inverse of A or not. Use proper output statements to get the input of the matrices with the certain dimensions.

Hint: Try matrix multiplication.

Q.No.3:

Write a program that has an array of 100 integers. Populate this array with numbers between 100-10000 both included. Then print out all Armstrong numbers in this array.

Note: If sum of cubes of each digit of the number is equal to the number itself, then the number is called an Armstrong number

Example of Armstrong number: 153 = (1 * 1 * 1) + (5 * 5 * 5) + (3 * 3 * 3).

Q.No.4:

Write a program that reads a marks of students' test scores in the range 0–200 for 100 students. It should then determine the number of students having scores in each of the following ranges: 0–24, 25–49, 50–74, 75–99, 100–124, 125–149, 150–174, and 175–200. Output the score ranges and the number of students. (You can populate the array with random numbers between 0-200).

Note: The output should be well formatted like a table.

Q.No.5:

Write a program that allows the user to enter the last names of five candidates in a local election and the number of votes received by each candidate. The program should then output each candidate's name, the number of votes received, and the percentage of the total votes received by the candidate. Your program should also output the winner of the election.

A sample output is:

Candidate	Votes Received	% of Total Votes
Asghar	5000	25.91
Akbar	4000	20.73
Zaid	6000	31.09
Nouman	2500	12.95
Asad	1800	9.33
Total	19300	

The Winner of the Election is Zaid.

Q. No.6.

Write a program that uses a two-dimensional array to store the highest and lowest temperatures for each month of the year. The program should output the average high, average low, and the highest and lowest temperatures for the year.

Q.No.7.

(Adding Large Integers) In C++, the largest int value is 2147483647. So, an integer larger than this cannot be stored and processed as an integer. Similarly, if the sum or product of two positive integers is greater than 2147483647, the result will be incorrect. One way to store and manipulate large integers is to store each individual digit of the number in an array. Write a program that inputs two positive integers of, at most, 20 digits and outputs the sum of the numbers. If the sum of the numbers has more than 20 digits, output the sum with an appropriate message. (**Hint:** Read numbers as strings and store the digits of the number in the reverse order.)

Q.No.8.

Jason, Samantha, Ravi, Sheila, and Ankit are preparing for an upcoming marathon. Each day of the week, they run a certain number of miles and write them into a notebook. At the end of the week, they would like to know the number of miles run each day, the total miles for the week, and average miles run each day. Write a program to help them analyze their data. Your program must contain parallel arrays: an array to store the names of the runners and a two-dimensional array of five rows and seven columns to store the number of miles run by each runner each day.

Q.No.9:

Write a program that randomly generates a 20x20 two-dimensional array, board, of type int. An element board[i][j] is a peak (either a maximum or a minimum) if all its neighbors (there should be either 3, 5, or 8 neighbors for any cell) are less than board[i][j], or greater than board[i][j]. The program should output all elements in board, with their indices, which are peak. It should also output if a peak is a maximum or a minimum

Q.No.10.

(**Airplane** Seating **Assignment**) Write a program that can be used to assign seats for a commercial airplane. The airplane has 13 rows, with five seats in each row. Rows 1 and 2 are first class, rows 3 through 7 are business class, and rows 8 through 13 are economy class. Your program must prompt the user to enter the following information:

a. Ticket type (first class, business class, or economy class)
b. Desired seat

Output the seating plan in the following form:

	A	B	C	D	E
Row 1	*	*	X	*	X
Row 2	*	X	*	X	*
Row 3	*	*	X	X	*
Row 4	X	*	X	*	X
Row 5	*	X	*	X	*
Row 6	*	X	*	*	*
Row 7	X	*	*	*	X
Row 8	*	X	*	X	X
Row 9	X	*	X	X	*
Row 10	*	X	*	X	X
Row 11	*	*	X	*	X
Row 12	*	*	X	X	*
Row 13	*	*	*	*	X

Here, * indicates that the seat is available; X indicates that the seat is occupied. Make this a menu-driven program; show the user's choices and allow the user to make the appropriate choices

GOOD LUCK 😍