CS 1002 – Programming Fundamentals (Fall 2023)
Assignment 1

Topics Covered:	**Submission Deadline:** *Tuesday – September 12, 2023 by 16.00 sharp*
▪ Problem solving: sequential, selection & repetition control structures ▪ Pseudocode and flowchart	

Submission Guidelines:

- Submit your own original work. **Plagiarism will not be tolerated**, either done from the internet and/or another student.
- Submit your **hand-written solutions** in your respective instructor's office.

Write pseudocode and draw flowchart for each of the problem given below. You are not allowed to use logical operators (i.e., AND or OR) for any purpose.

Problem # 1:

Write an application for a bottle vending machine in which a customer inserts an amount and selects the cold drink he/she wants. We assume that the vending machine has five following beverages (7up, Fanta, Sprite, Pepsi, Coke). Show the beverages and their prices (of your choice) to the user. Display the beverage name selected by the user, its price and the remaining amount after purchase of a cold drink. Machine would display an error message: "Out of money" if the amount entered by the user is less than the cost of beverage, he/she wants to purchase. Following is just a sample, values in the red are user inputs.

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Welcome to the vending machine. We have following drinks.

Enter 1 for Pepsi, price = Rs. 80
Enter 2 for Coke, price = Rs. 80
Enter 3 for 7up, price = Rs. 75
Enter 4 for Sprite, price = Rs. 79
Enter 5 for Fanta, price = Rs. 76

Which drink do you want? 2
Enter the amount you have? 70

Out of money, you cannot buy a Coke
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Problem # 2:

A private electricity company needs an application that allows their customers to calculate their

electricity bills. A customer will input units consumed and his/her bill will be calculated according to the following criteria:

- For first 40 units Rs. 8/unit
- For next 60 units Rs. 10/unit
- For next 60 units Rs. 14/unit
- For unit above 250 Rs. 18/unit

Furthermore, fuel surcharges of 20% and Govt. Tax of 15% will also be included to a customer's bill. Calculate and display the total bill of a customer.

Problem # 3:

Amjad goes to school on weekdays (Monday to Friday). He has got a money box from whichhe gets his expenses for the round trip of the school daily. He puts his hand in the box and pulls some notes. If the total amount of note(s) is above 260 rupees, he travels by rickshaw. If the amount is between 150-260, he travels by bus. Otherwise, he goes on bicycle. Rickshaw fare is 130 rupees andbus costs 75 rupees for one sided travel. In the school he eats candies for all the remaining amountthat is left after the travelling expenses. Each candy costs 5 rupees. Print the amount spent on travelling and candies. If some amount is left behind, then it is put back in the money box.

Problem # 4:

A library charges a fine for every book returned late. For first 5 days late, the fine is Rs. 50, for 6-10 days late an additional fine of Rs. 100 per day will be charged, and if the late days are above 10 then the fine is Rs. 200 per day. If a book is returned after 30 days, then Rs. 400 per day will be charged and the student's membership will be cancelled. You have to write an application for a library which will take the following inputs and calculate total fine (if any) for a student.

Inputs: no. of books to be returned, no. of late days for each book (0 would mean the book is returned timely).

Problem # 5:

You found an exciting summer job for five weeks. It pays, say, Rs. 500 per hour. Suppose that the total tax you pay on your summer job income is 13%. After paying the taxes, you spend 10% of your net income to buy new clothes and other accessories for the next school year and 3% to buy school supplies. After buying clothes and school supplies, you use 25% of the remaining money to buy savings bonds. For each 100 rupee you spend to buy savings bonds, your parents spend Rs. 50 to buy additional savings bonds for you.

Write a program that prompts the user to enter the pay rate for an hour and the number of hours you worked each week. The program then outputs the following:

a. Your income before and after taxes from your summer job.
b. The money you spend on clothes and other accessories.
c. The money you spend on school supplies.
d. The money you spend to buy savings bonds.
e. The money your parents spend to buy additional savings bonds for you.

Problem # 6:

Take a positive integer as an input from the user, calculate and print the number of digits in the input value. For example, if the input is 4 then the output is "1 digit"; if the input is 97 then the output is "2 digits"; if the input is 312 then the output is "3 digits", and so on. Note that a user may enter an integer of any number of digits. (Hint: Use modulus and division operators)

Problem # 7:

Usually, cashiers face challenges counting the amount to be returned after the billing in supermarkets or malls. We want to write an application for a cashier to help him/her. Let's assume the cashier has the following currency notes: 1000, 500, 100, 50, 20, 10, and, coins of 5, 2, and 1. Your application should ask the total bill of a customer and the amount paid by the customer. Calculate and display the exact number of notes/coins required to provide a change to a customer, see the following sample (values in the red are user inputsJ).

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Welcome to CS1002 change calculation application

Enter customer's total bill = Rs. 7810
Enter amount paid by customer = Rs. 10000

Change to be returned = Rs. 2190
1000 rupees notes = 2
500 rupees notes = 0
100 rupees notes = 1
50 rupees notes = 1
20 rupees notes = 2
10 rupees notes = 0
5 rupees coins = 0
2 rupees coins = 0
1 rupee coin = 0
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Problem # 8:

Input a positive number from the user. Calculate and show the factorial of the number, see examples below to understand the factorial (denoted as !).

1! = 1
2! = 2 x 1 = 2
3! = 3 x 2 x 1 = 6
4! = 4 x 3 x 2 x 1 = 24
5! = 5 x 4 x 3 x 2 x 1 = 120

Problem # 9:

We want a mathematical application which will take a starting and an ending value from the user,

and it will print the following series (starting and ending values in inclsive).

a. Summation of all the numbers
b. Display all even numbers and their summation
c. Display all odd numbers and their summation
d. Display all multiplicative terms of 5

Problem # 10:

Write an application for your CS1002 instructor who wants to find three students with highest and lowest marks in the mid-term exam. Your application should first ask for the class size (i.e., no. of students), input the mid-exam marks for each student. Find and display the three highest and three lowest marks of the class.