|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **C Language Problems**  **Problem 31: Electricity bill [20 Points]**  KE starts a new trainee program for CS students in which they have to generate a system that can automatically generate a bill for the residential consumer by taking the reading of units consume during the month. Alisha joins the trainee program and understands the whole process of electricity bill generation.  Electricity Charges = KE Charges + Sales tax 13%  KE Charges Table   |  |  | | --- | --- | | Units | Rate per unit | | <= 200 units | 8.11 | | 201-300 units | 10.20 | | >300 | 13.40 |   Help Alisha to generate a system that takes unit consume in a month and calculate the electricity charges to be paid by a consumer.  **Test case:**  Input:  Unit consume: 350  Output:  KE charges : 3,312 (Explanation: 200\*8.11 + 100\*10.20 + 50\*13.40)  Sales tax 13%: 430.56 (Explanation: 3312\*0.13)  Electricity Charges to pay: 3742.56 (Explanation: 3312 + 430.56)  **Problem 32: Special Code[20 Points]**  Mahnoor has recently hired as an internee by Telenor. Telenor is launching a new super-duper card service for its customers. This card contains a special code for activation. This special code is a 5 digit code generated in a way that the sum of the digits should be even. To generate this code 4 digit number is taken randomly and the 5th digit is added to make the sum even. Mahnoor needs your help to generate this special code.    Hint: Calculate the sum of the given 4 digits and then decide whether the 5th digit is 1 or 0.  **Test case:**  **Test case1:**  Input 🡪 4586  Output🡪 45850 (Explanation: 4+5+8+5 =22 even so add 0)  **Test case2:**  Input 🡪 1572  Output 🡪 15721 (Explanation:1+5+7+2 =15 odd so add 1 to make it even)  **Problem 33: GPA Calculator [20 Points]**  Vishal is a first-semester student at DSU, he wants to generate a GPA calculator that helps him calculate his GPA for 1st semester. Help Vishal by using the below instructions.  a) Marks to GP Converter: Take marks as input from the user and convert it in GP according to the given table.  Screen Clipping  b) Vishal took 7 courses in the first semester, 5 theory courses having credit\_hours=3, and 2 Lab courses having credit\_hours=1. Use the below formula to calculate GPA.  GPA  **Test case:**  Input:  Marks 🡪 IICT=87 PF=85 Phy=70 Cal=65 Eng=80 PF\_Lab =85 IICT\_Lab=85  Output:   1. GP 🡪 IICT = 4 PF=3.67 Phy=2.67 Cal=2.5 Eng=3.67 PF\_Lab =3.67 IICT\_Lab=3.67 2. GPA of the first semester is 3.345 |

**Problem 34: Hotel Pricing [20 Points]**

Asad and his friends are planning to go on vacation after the semester examination. They planned to explore the natural beauty of Hunza Valley. Asad takes the responsibility to arrange the hotel and calculate the charges. Talha suggests him to book a room in Luxus Hunza hotel and give him the complete details about the pricing of the hotel.

**Hotel Pricing**

|  |  |
| --- | --- |
| **Room with Lake (1)** | **Room with Garden (2)** |
| 2 Persons: Rs 20,000 /day | 2 Persons: Rs 16,000 /day |
| 3 persons: Rs 25,000/day | 3 persons: Rs 20,000/day |
| 4 persons: Rs 30,000/day | 4 persons: Rs 24,000/day |
| Additional people: 5000/person per day | Additional people: 4000/person per day |

Luxus hotel gives 10% discount to students and you can get an additional 20% discount if you plan to stay for 7 or more days.

Help Asad to calculate the total charges for their stay in Luxus Hunza hotel and the per person charge to distribute the total amount among all.

**Test case:**

Input:

No. of persons = 5, Type of Room (1or2) = 1, No. of days = 7, Student card(Y/N) = Y

Output:

Total charges = 171,500

Per Person Expense for stay in hotel = 34,300.

**Problem 35: Covid-19 Diagnosis [20 Points]**

Waqqam and Adnan are best friends, they both want to help the community in the difficult situation of Covid-19. They have their eye on the whole situation of Covid-19 and observe that due to the fear of Covid-19 people are going for testing even if they just have seasonal flu. There is very less testing facility available in their city and it is very crucial to decide whether a person has to go for Covid-19 testing or not. Waqqam has a medical background and Adnan has a CS background they both decided to use their knowledge to generate a system that can help doctors.

Waqqam collects all the information about the virus and the symptoms of Covid-19 which are Fever, Dry cough, Loss of taste or smell, sore throat, and diarrhea. Adnan generates a system that asks the user about each symptom and if the user has at least 3 of the given symptoms the system recommends them to test otherwise no need for the test. Help Adnan to generate the covid-19 diagnosis system.

**Test Cases:**

|  |  |
| --- | --- |
| **Test Case1** | **Test Case 2** |
| **Input:** | **Input:** |
| Fever (Y/N): Y | Fever (Y/N): Y |
| Dry cough (Y/N): Y | Dry cough (Y/N): N |
| Loss of taste or smell (Y/N): Y | Loss of taste or smell (Y/N): N |
| Sore throat (Y/N): N | Sore throat (Y/N): Y |
| Diarrhea (Y/N): Y | Diarrhea (Y/N): N |
| **Output:** | **Output:** |
| You have more than 3 symptoms of Covid-19 | You have only 2 symptoms of Covid-19 |
| System recommend you to go for testing immediately | System recommend you to stay at home |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Problem 41: Armstrong Number [15 Points]**  Armstrong number is a number that is equal to the sum of cubes of its digits. For example 0, 1, 153, 370, 371 and 407 are the Armstrong numbers.  Let's try to understand why 153 is an Armstrong number.   1. 153 = (1\*1\*1)+(5\*5\*5)+(3\*3\*3) 2. where: 3. (1\*1\*1)=1 4. (5\*5\*5)=125 5. (3\*3\*3)=27 6. So: 7. 1+125+27=153  |  |  | | --- | --- | | **Test case 1:** | **Test case 2:** | |  |  | | Input: | Input: | | Number: 371 | Number: 252 | |  |  | | Output: | Output: | | (3\*3\*3) = 27 | (2\*2\*2) = 8 | | (7\*7\*7) = 343 | (5\*5\*5) = 125 | | (1\*1\*1) = 1 | (2\*2\*2) = 8 | | Sum= 371 | Sum =141 | | 371 is an Armstrong number | 252 is not an Armstrong number |   **Problem 42: The Lead Game [15 Points]**  UBL Sport Club organizes an annual cricket tournament where the top two teams play against each other. The Manager of UBL Sports Club decided to add his own twist to the game by changing the rules for determining the winner. In his version, at the end of each round, the cumulative score for each team is calculated, and the leader and her current lead are found. Once all the rounds are over the team who had the maximum lead at the end of any round in the game is declared as the winner.  Consider the following score sheet for a game with 3 rounds:   |  |  |  | | --- | --- | --- | | Round | Team 1 | Team 2 | | 1 | 140 | 82 | | 2 | 89 | 134 | | 3 | 90 | 110 |   The total scores of both players, the leader and the lead after each round for this game is given below:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Round | Team 1 | Team 2 | Leader | Lead | | 1 | 140 | 82 | Team 1 | 58 | | 2 | 229 | 216 | Team 1 | 13 | | 3 | 319 | 326 | Team 2 | 7 |   Note that the above table contains the cumulative scores.  The winner of this game is Team 1 as he had the maximum lead (58 at the end of round 1) during the game.  Your task is to help the Manager find the winner and the winning lead. You may assume that the scores will be such that there will always be a single winner. That is, there are no ties.  **Test case:**  **Input:**  Team1 🡪 Round 1: 140, Round 2: 89, Round 3: 90  Team2 🡪 Round 1: 82 Round 2: 134, Round 3: 110  **Output:**  Round 1 🡪 Team 1: 140 Team 2: 89 Leader: Team 1 Lead: 58  Round 2 🡪 Team 1: 229 Team 2: 216 Leader: Team 1 Lead: 13  Round 3 🡪 Team 1: 319 Team 2: 326 Leader: Team 2 Lead: 7  The winner of tournament is team 1 with highest lead 58. |

**Problem 43: Guessing Game [15 Points]**

Aliysha loves to play games and wants to become a game developer. Recently she got a chance to learn programming during Covid-19 lockdown. She want to develop her first guessing game to astonish her friends. Aliysha needs your help to develop her first game.

Rules for Game:

* A random number is generated and asks the user to guess what the number is.
* If the user's guess is higher than the random number, the program should display "Too high, try again."
* If the user's guess is lower than the random number, the program should display "Too low, try again."
* User have 5 chances to guess the number.
* If he/she guesses within 5 chances he/she wins otherwise he lose and game is over.

**Test cases:**

**Test case1:** (Suppose Random number is 56)

Input: Output:

Guess 1: 15 Too Low

Guess 2: 50 Too Low

Guess 3: 75 Too High

Guess 4: 60 Too High

Guess 5: 56 Well done! You Win the Game

**Test case 2:** (Suppose Random number is 35)

Input: Output:

Guess 1: 20 Too Low

Guess 2: 30 Too Low

Guess 3: 75 Too High

Guess 4: 50 Too High

Guess 5: 40 Game Over!

**Problem 44: Super Digit [15 Points]**

We define super digit of an integer using the following rules:

• If n has only 1 digit, then its super digit is n.

• Otherwise, the super digit of n is equal to the super digit of the digit-sum of n. Here, digit-sum of a number is defined as the sum of its digits.

**For example**: Super digit of 9875 is 2

**Explanation:** Sum of digits of 9875 (9+8+7+5) is 29, As 29 is not a single digit so again calculate the sum of digits of 29 (2+9) is 11, 11 is not a single digit so again calculate the sum of digits of 11 (1+1) is 2. 2 is a single digit that’s why 2 is the super digit of 9875.

**Test Cases:**

|  |  |
| --- | --- |
| **Test case 1:** | **Test case 2:** |
|  |  |
| Input: | Input: |
| Number: 45622 | Number: 1233 |
|  |  |
| Output: | Output: |
| Sum of digits of 45622 is 19 | Sum of digits of 1233 is 9 |
| Sum of digits of 19 is 10 | 9 is the super digit of 1233 |
| Sum of digits of 10 is 1 |  |
| 1 is the super digit of 45622 |  |

**Problem 45: Chess Board [15 Points]**

Remember number of square in a chess board problem in Assignment 2, In which you have find the number of squares in any given nxn chess board. Generate your Algorithm and implement it for the following results.

**Test Case:**

**Input:**

Chess board size: 5

**Output:**

No. of 5x5 squares is 1

No. of 4x4 squares is 4

No. of 3x3 squares is 9

No. of 2x2 squares is 16

No. of 1x1 squares is 25

Total number of squares is chess board is 55