ICS 1101 Problem Solving and Programming in C
Assignment 2

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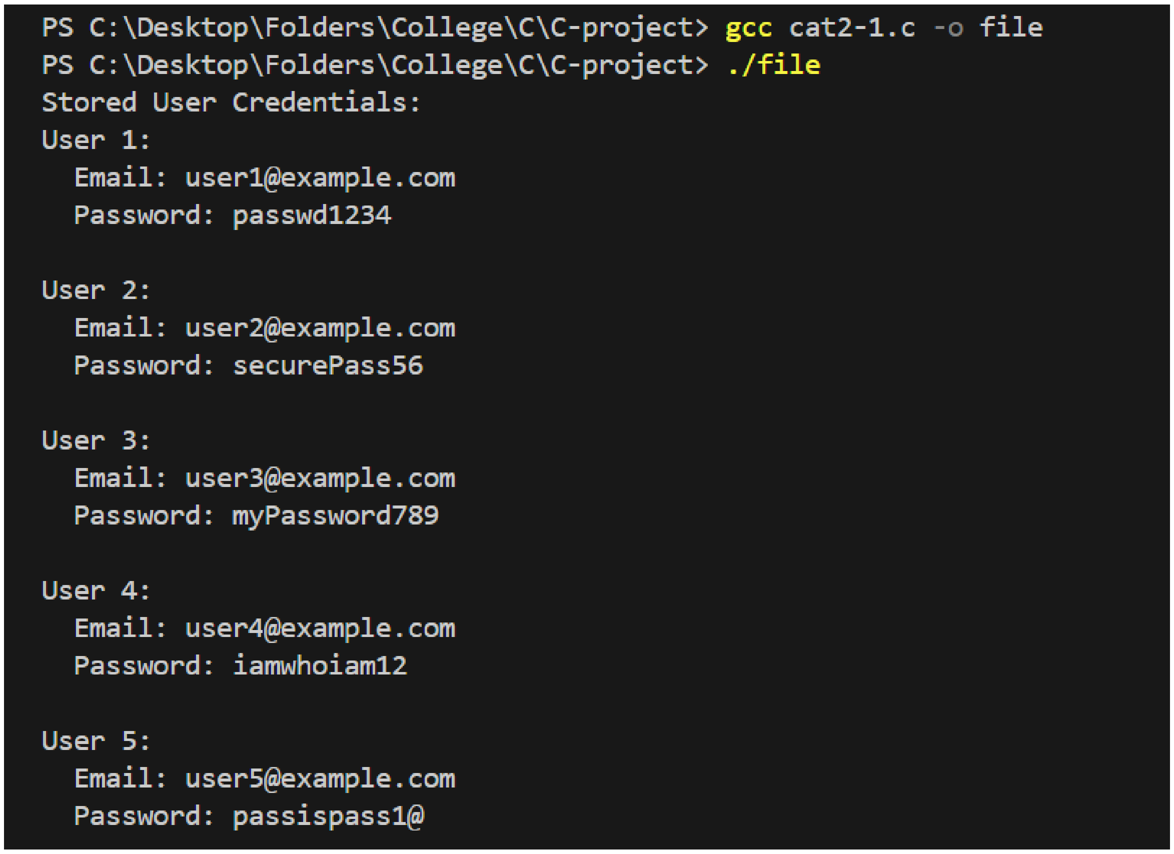
1. Develop a program using structures to store user credentials (email and password). Create and initialize an array of any 5 user credentials.

Code:

```
#include <stdio.h>
#include <string.h>
// Define a structure to store user credentials
typedef struct UserCredentials {
    char email[50];
    char password[50];
}Cred;
int main() {
    // Initialize an array of 5 user credentials
    Cred users[5] = {
        {"user1@example.com", "passwd1234"},
        {"user2@example.com", "securePass56"},
        {"user3@example.com", "myPassword789"},
        {"user4@example.com", "iamwhoiam12"},
        {"user5@example.com", "passispass1@"}
    };
    // Display the user credentials
    printf("Stored User Credentials:\n");
    for (int i = 0; i < 5; i++) {
        printf("User %d:\n", i + 1);
        printf("  Email: %s\n", users[i].email);
        printf("  Password: %s\n\n", users[i].password);
    }
    return 0;
}
}
```

Explanation:
Structure Definition:A structure UserCredentials is defined to hold an email and a password, both as strings.
Initialization:An array of 5 UserCredentials structures is created and initialized with sample credentials.
Display:A loop iterates through the array to print each user's email and password.

Output:



```
PS C:\Desktop\Folders\College\C\C-project> gcc cat2-1.c -o file
PS C:\Desktop\Folders\College\C\C-project> ./file
Stored User Credentials:
User 1:
  Email: user1@example.com
  Password: passwd1234

User 2:
  Email: user2@example.com
  Password: securePass56

User 3:
  Email: user3@example.com
  Password: myPassword789

User 4:
  Email: user4@example.com
  Password: iamwhoiam12

User 5:
  Email: user5@example.com
  Password: passispass1@
```

2. Input a username and password and demonstrate the working of your authentication system for all possible test cases.

Code:

```
#include <stdio.h>
#include <string.h>

// Define a structure to store user credentials
typedef struct UserCredentials {
    char email[50];
    char password[50];
}Cred;

// Function to validate the email format
int isValidEmail(char email[]) {
    int atFlag = 0, dotFlag = 0;
    for (int i = 0; email[i] != '\0'; i++) {
        if (email[i] == '@') {
            atFlag = 1;
        }
        if (email[i] == '.' && atFlag) {
            dotFlag = 1;
        }
    }
    return atFlag && dotFlag;
}

// Function to validate password format
int isValidPassword(char password[]) {
if(strlen(password) >= 8;)
return 1;
else return 0;
}

// Function to authenticate user
int authenticateUser(Cred users[], int size, char email[], char password[]) {
    for (int i = 0; i < size; i++) {
        if (strcmp(users[i].email, email) == 0 && strcmp(users[i].password, password) == 0) {
            return 1; // Authentication successful
        }
    }
    return 0; // Authentication failed
}

int main() {
    // Initialize an array of 5 user credentials
    struct User users[5] = {
        {"user1@example.com", "password1234"},
        {"user2@example.com", " securePass56"},
        {"user3@example.com", "myPassword789"},
        {"user4@example.com", " iamwhoiam12"},
        {"user5@example.com", “passispass1@"}
    };

    char inputEmail[50], inputPassword[50];

    // Input email and password
    printf("Enter your email: ");
    scanf("%s", inputEmail);
    printf("Enter your password: ");
    scanf("%s", inputPassword);

    // Validate email and password format
    if (!isValidEmail(inputEmail)) {
        printf("Error: Invalid email format.\n");
        return 1;
    }

    if (!isValidPassword(inputPassword)) {
        printf("Error: Password must be at least 8 characters long.\n");
        return 1;
    }

    // Authenticate user
    if (authenticateUser(users, 5, inputEmail, inputPassword)) {
        printf("Login successful.\n");
    } else {
        printf("Error: Invalid credentials.\n");
    }

    return 0;
}
```

Explanation:

1. ***Structure and Data:***

The UserCredentials structure holds email and password.
An array of 5 users is initialized with example credentials.

2. ***Functions:***

isValidEmail: Checks if the email contains both @ and . after @.
isValidPassword: Ensures the password is at least 8 characters long.
authenticateUser: Compares the entered email and password with the stored credentials in the users array.

3. ***Main Program:***

   The program prompts the user for their email and password.
   It validates the input formats using isValidEmail and isValidPassword.
   If valid, it calls authenticateUser to check against stored credentials.
   It prints appropriate messages for success or failure.

   Test Cases:
   Case 1: Valid email and password, correct credentials
   Input:
   Enter your email: user1@example.com
   Enter your password: password1234
   Output:
   Login successful.

Case 2: Valid email and password, incorrect credentials
Input:
Enter your email: user1@example.com
Enter your password: wrongPassword
Output:
Error: Invalid credentials.

Case 3: Invalid email format
Input:
Enter your email: user1example.com
Enter your password: password1234
Output:
Error: Invalid email format.

Case 4: Password too short
Input:
Enter your email: user1@example.com
Enter your password: short
Output:
Error: Password must be at least 8 characters long.

3. Write a C program to manage and analyse sales data for any number of days using dynamic memory allocation.

Code:

```
#include <stdio.h>
#include <stdlib.h>

// Function prototypes
void inputSales(float *sales, int days);
void addNewSale(float **sales, int *days);
void displaySales(float *sales, int days);
float calculateTotalSales(float *sales, int days);

int main() {
   int days;
   float *sales = NULL; // Pointer for dynamically allocated memory
   int choice;

   // Ask the user to input the number of days
   printf("Enter the number of days to track sales: ");
   scanf("%d", &days);
```

```
// Allocate memory for the sales data
sales = (float *)malloc(days * sizeof(float));
if (sales == NULL) {
    printf("Memory allocation failed.\n");
    return 1;
}

// Menu-driven program
do {
    printf("\nMenu:\n");
    printf("1. Input Sales\n");
    printf("2. Add a New Sale\n");
    printf("3. Display Sales\n");
    printf("4. Calculate Total Sales\n");
    printf("5. Exit\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    switch (choice) {
        case 1:
            inputSales(sales, days);
            break;
        case 2:
            addNewSale(&sales, &days);
            break;
        case 3:
            displaySales(sales, days);
            break;
        case 4: {
            float total = calculateTotalSales(sales, days);
            printf("Total Sales: %.2f\n", total);
            break;
        }
        case 5:
            printf("Exiting the program.\n");
            break;
        default:
            printf("Invalid choice. Please try again.\n");
    }
} while (choice != 5);

// Free the allocated memory
free(sales);
```

```
    return 0;
}

// Function to input sales data for all days
void inputSales(float *sales, int days) {
    for (int i = 0; i < days; i++) {
        printf("Enter sales for day %d: ", i + 1);
        scanf("%f", &sales[i]);
    }
}

// Function to add sales data for an additional day
void addNewSale(float **sales, int *days) {
    (*days)++;
    *sales = (float *)realloc(*sales, (*days) * sizeof(float));
    if (*sales == NULL) {
        printf("Memory allocation failed.\n");
        exit(1);
    }
    printf("Enter sales for day %d: ", *days);
    scanf("%f", &(*sales)[*days - 1]);
}

// Function to display sales data
void displaySales(float *sales, int days) {
    printf("Sales data:\n");
    for (int i = 0; i < days; i++) {
        printf("Day %d: %.2f\n", i + 1, sales[i]);
    }
}

// Function to calculate the total sales
float calculateTotalSales(float *sales, int days) {
    float total = 0.0;
    for (int i = 0; i < days; i++) {
        total += sales[i];
    }
    return total;
}
```

<u>Explanation</u>

1. ***<u>Dynamic Memory Allocation:</u>***

The program uses malloc to allocate memory dynamically for the sales data array. realloc is used to expand the memory when adding a new sale.

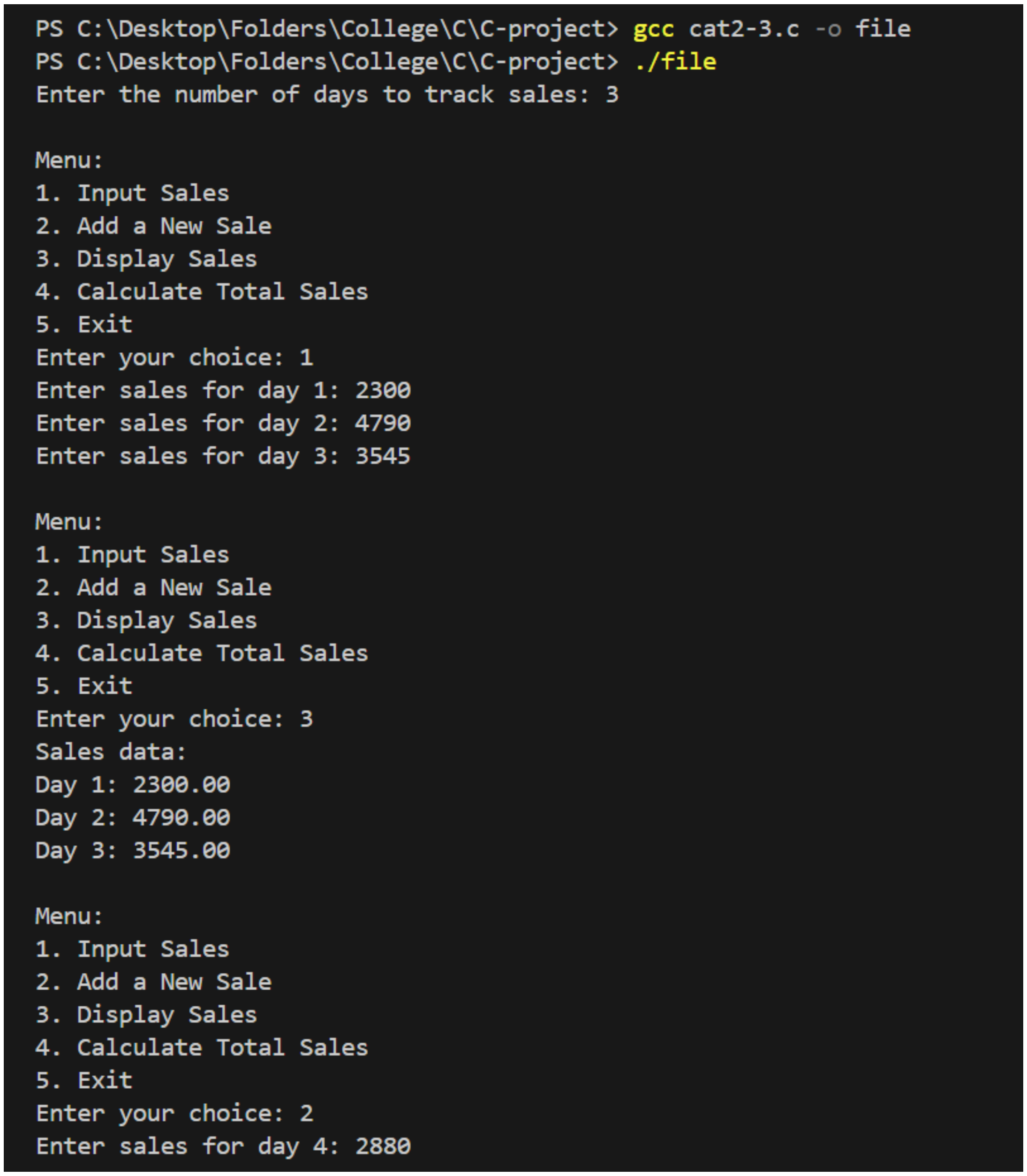
2. ***Functions:***

inputSales: Inputs sales data for all days.
addNewSale: Adds sales data for an additional day by reallocating memory.
displaySales: Displays all sales data entered by the user.
calculateTotalSales: Computes the total of all sales

3. ***Menu:***

A menu allows the user to choose actions repeatedly until they decide to exit.

Output:

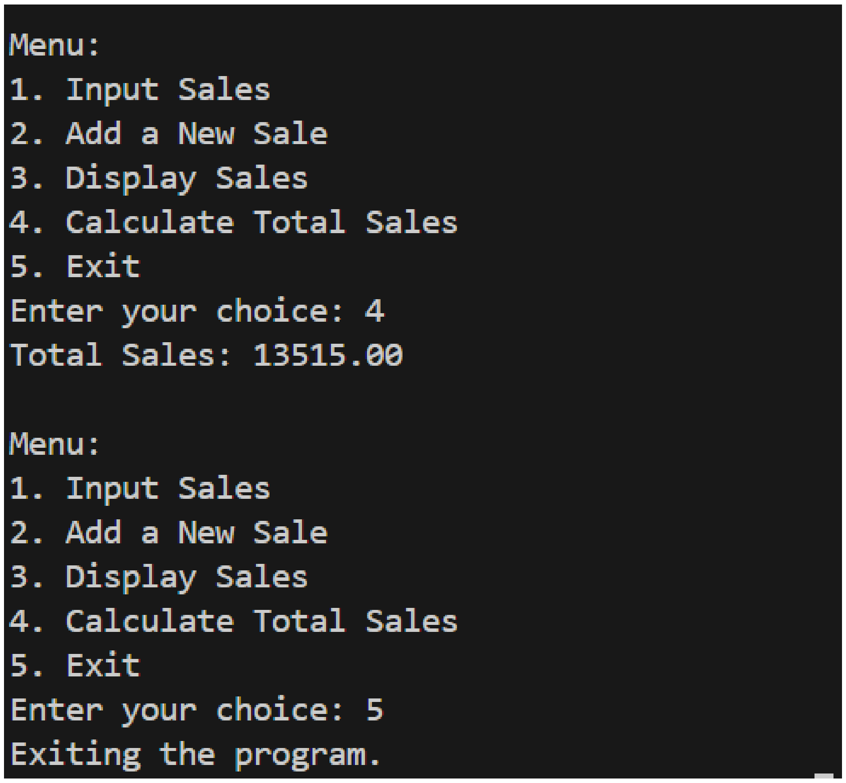


```
PS C:\Desktop\Folders\College\C\C-project> gcc cat2-3.c -o file
PS C:\Desktop\Folders\College\C\C-project> ./file
Enter the number of days to track sales: 3

Menu:
1. Input Sales
2. Add a New Sale
3. Display Sales
4. Calculate Total Sales
5. Exit
Enter your choice: 1
Enter sales for day 1: 2300
Enter sales for day 2: 4790
Enter sales for day 3: 3545

Menu:
1. Input Sales
2. Add a New Sale
3. Display Sales
4. Calculate Total Sales
5. Exit
Enter your choice: 3
Sales data:
Day 1: 2300.00
Day 2: 4790.00
Day 3: 3545.00

Menu:
1. Input Sales
2. Add a New Sale
3. Display Sales
4. Calculate Total Sales
5. Exit
Enter your choice: 2
Enter sales for day 4: 2880
```



```
Menu:
1. Input Sales
2. Add a New Sale
3. Display Sales
4. Calculate Total Sales
5. Exit
Enter your choice: 4
Total Sales: 13515.00

Menu:
1. Input Sales
2. Add a New Sale
3. Display Sales
4. Calculate Total Sales
5. Exit
Enter your choice: 5
Exiting the program.
```

Key Features:

1. The program handles any number of days as specified by the user.
2. It ensures efficient memory usage by dynamically allocating and reallocating memory.
3. It supports adding more days dynamically and recalculates totals accurately.